

National Aeronautics and
Space Administration




EXPLORE SOLAR SYSTEM & BEYOND

NASA Town Hall

AAS 238th Meeting | June 7, 2021

Paul Hertz

Director, Astrophysics Division
Science Mission Directorate

 @NASAUniverse @NASAExoplanets

Paul Hertz

Megan Ansdell
Steven Crawford
Nicola Fox
Patricia Knezek
William Latter
Mario Perez
Eric Smith
Heather Watson

Thomas H. Zurbuchen

Louis Barbier
Daniel Evans
Hannah Jang-Condell
Patrick Koehn
Roopesh Ojha
Natasha Pinol
Linda Sparke

Charts posted at <http://science.nasa.gov/astrophysics/documents>



Outline

- **2021 – A Year of Science:** 2021 Highlights / Upcoming Launches / Inclusion & Diversity / COVID Update
- **The NASA Team:** NASA Astrophysics Headquarters Staff / AAS Announcements / Public Service Announcement: Keep Connected
- **Research Program Update:** COVID Impacts / Funding & Selections / Initiatives / Dual Anonymous Peer Review / Open Data / Citizen Science / Public Service Announcement: Volunteer
- **Mission Program Update:** Operations / Small to Large / Pioneers / Explorers / Webb / Roman
- **Planning for the Future:** Budget / Decadal Survey / 2021 – A Year of Science
- **Special Announcement:** Thomas Zurbuchen



2021 – A Year of Science



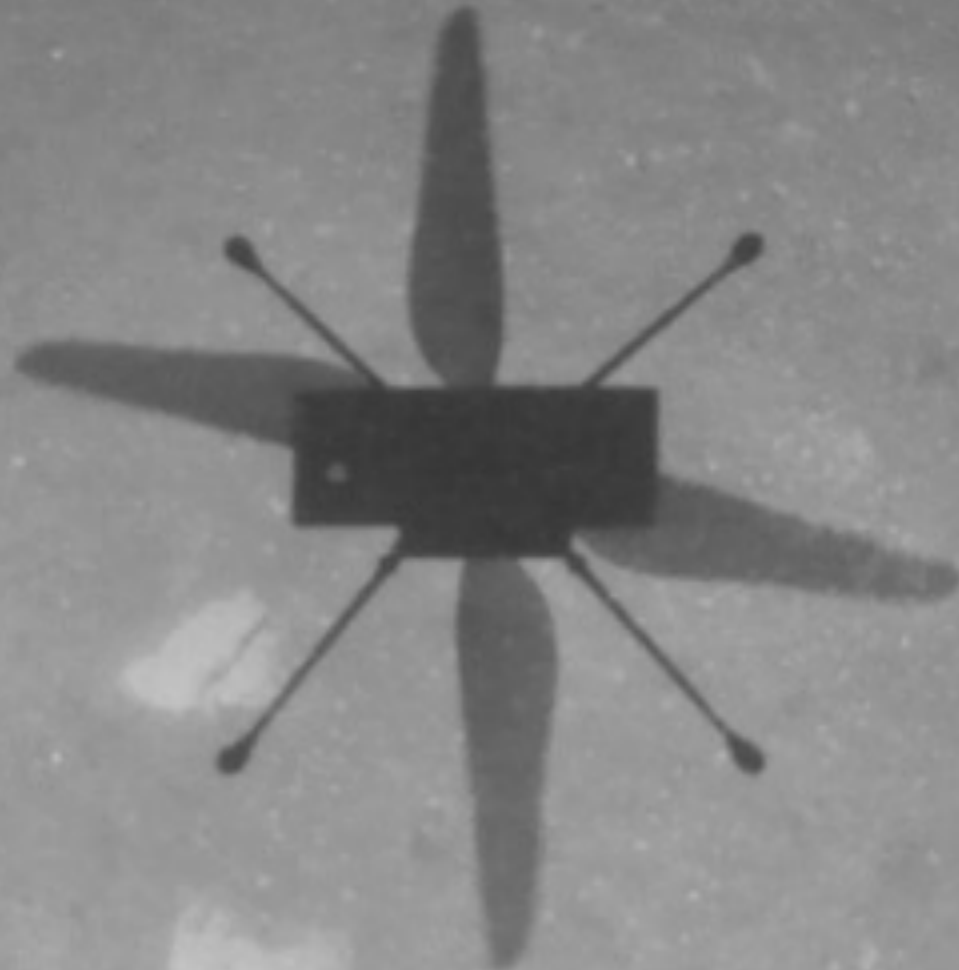
Landing: Feb 28, 2021

https://www.youtube.com/watch?v=4czjS9h4Fpg&ab_channel=NASA



Credit: NASA/JPL-Caltech

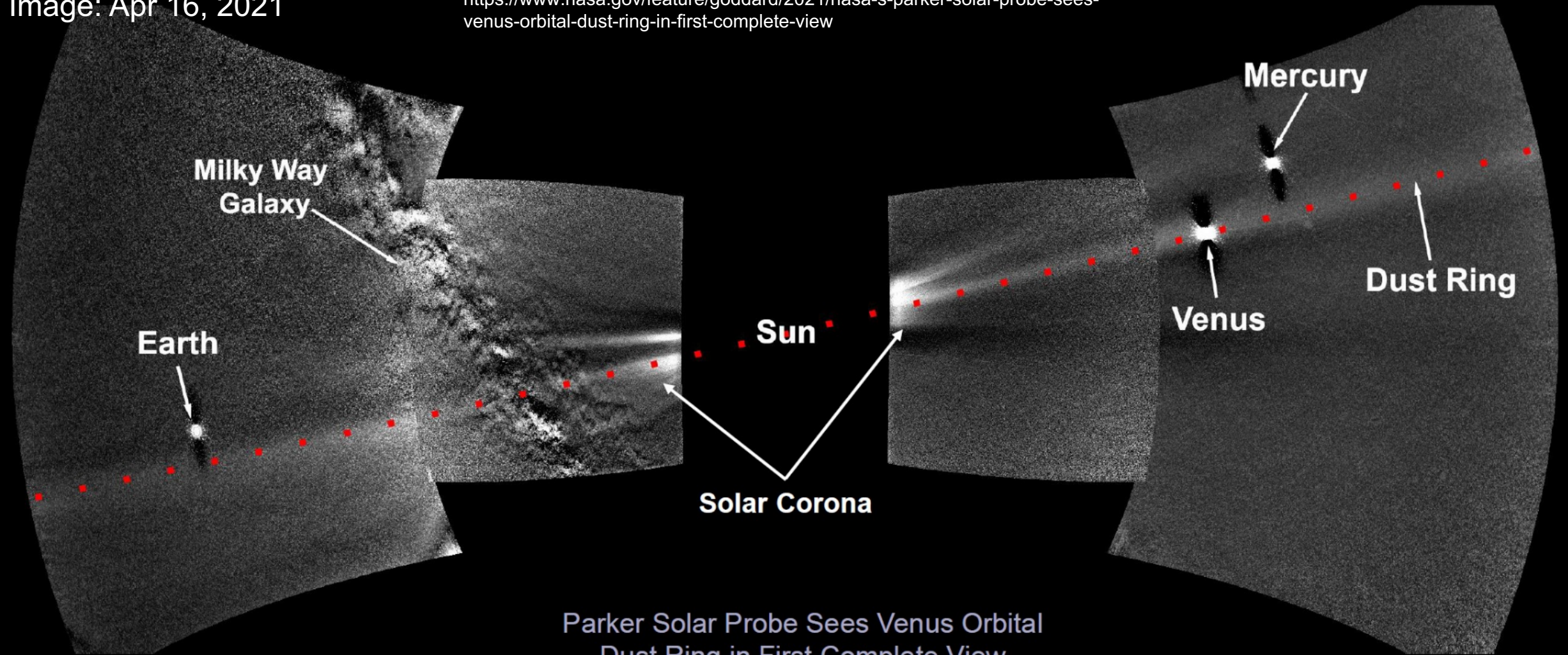
Take off: Apr 19, 2021



NASA's Ingenuity Mars Helicopter took this shot, capturing its own shadow, while hovering over the Martian surface on April 19, 2021, during the first instance of powered, controlled flight on another planet. Photo Credit: NASA/JPL-Caltech

Image: Apr 16, 2021

<https://www.nasa.gov/feature/goddard/2021/nasa-s-parker-solar-probe-sees-venus-orbital-dust-ring-in-first-complete-view>

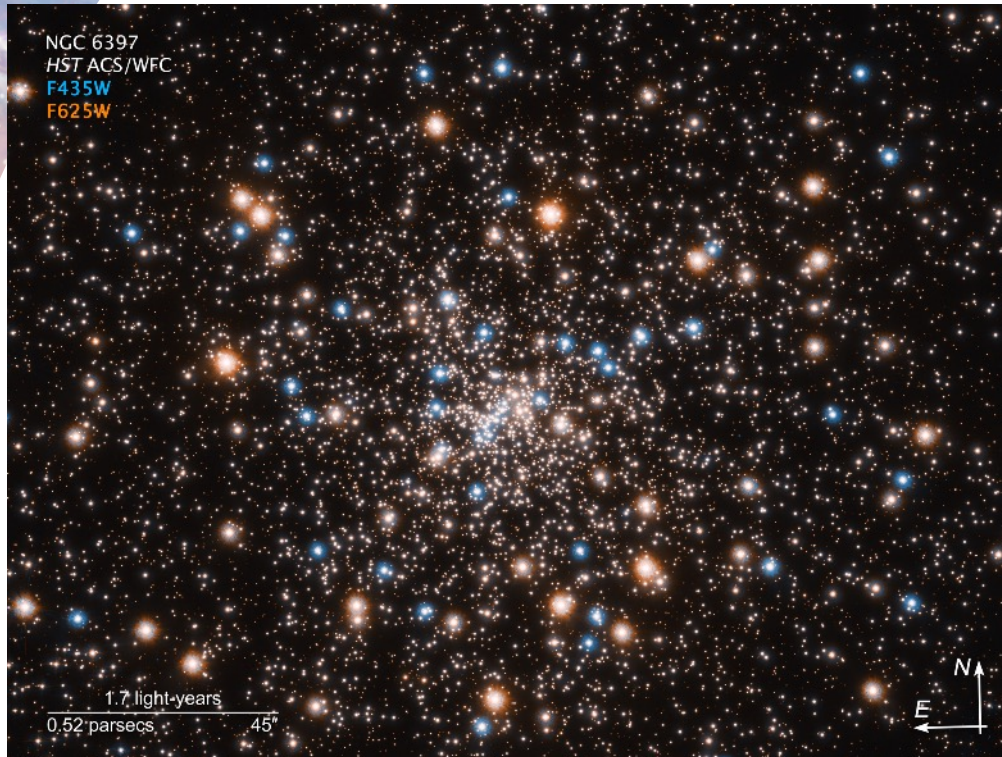


Parker Solar Probe Sees Venus Orbital Dust Ring in First Complete View

Though earlier missions have made some observations of Venus' orbital dust ring, Parker Solar Probe's images are the first to show the planet's dust ring for nearly its entire 360-degree span around the Sun.

The dust ring stretches diagonally from the lower left to the upper right of the image. The bright objects are planets: from left to right, Earth, Venus, and Mercury. Part of the Milky Way galaxy is visible on the left side. The streaks emanating from the center of the image is the solar corona. The four frames of this composite image were captured on Aug. 25, 2019

Hubble finds a 'crush' of black holes



Astronomers found something they weren't expecting at the heart of the globular cluster NGC 6397: a concentration of smaller black holes lurking there instead of one massive black hole.

W. Vitral and G. Mamon, A&A, 646, A63 (2021)
<https://doi.org/10.1051/0004-6361/202039650>

Hubble news:

- Latest solar analysis predicts Hubble orbit decay NET 2036
- New on-board software has reduced pointing jitter and reduced slew time

Fermi reveals extragalactic magnetar giant flare



Fermi's Large Area Telescope detected GeV photons within minutes of the outburst.

- Highest energy light ever detected from a magnetar flare

Higher energy and later timing suggest that an ultra-relativistic outflow collided with the magnetar bow shock to produce the GeV photons.

Fermi's Gamma-ray Burst Monitor detected a short outburst of gamma rays on April 15, 2020.

- Emission rose in 77 ms, 100 times faster than typical neutron star merger events that generate short gamma-ray bursts
- A giant flare from a magnetar explains the rapid variability and the coincidence with nearby galaxy Sculptor (NGC 253, 3.5 Mpc) of the multi-mission location for the burst.



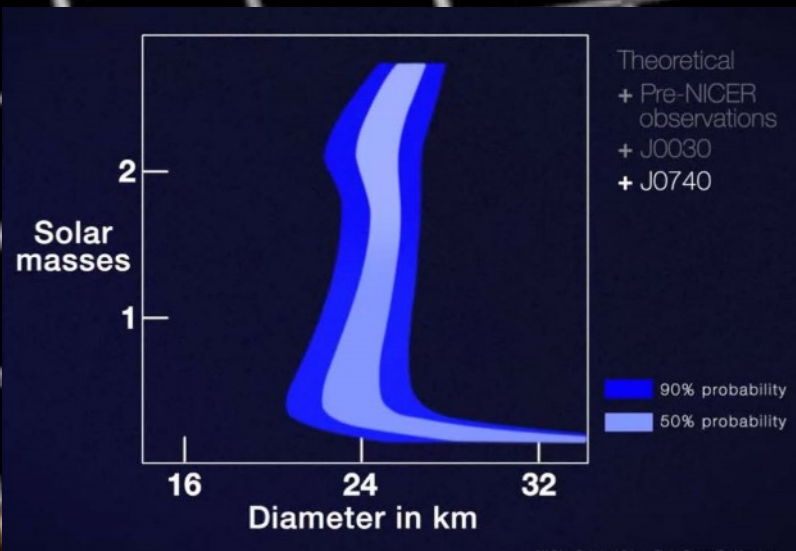
A few percent of short gamma-ray bursts may be magnetar giant flares.

<https://www.nature.com/articles/s41550-020-01287-8> <https://www.nature.com/articles/s41586-020-03077-8>

NICER Probes the Squeezability of Neutron Stars

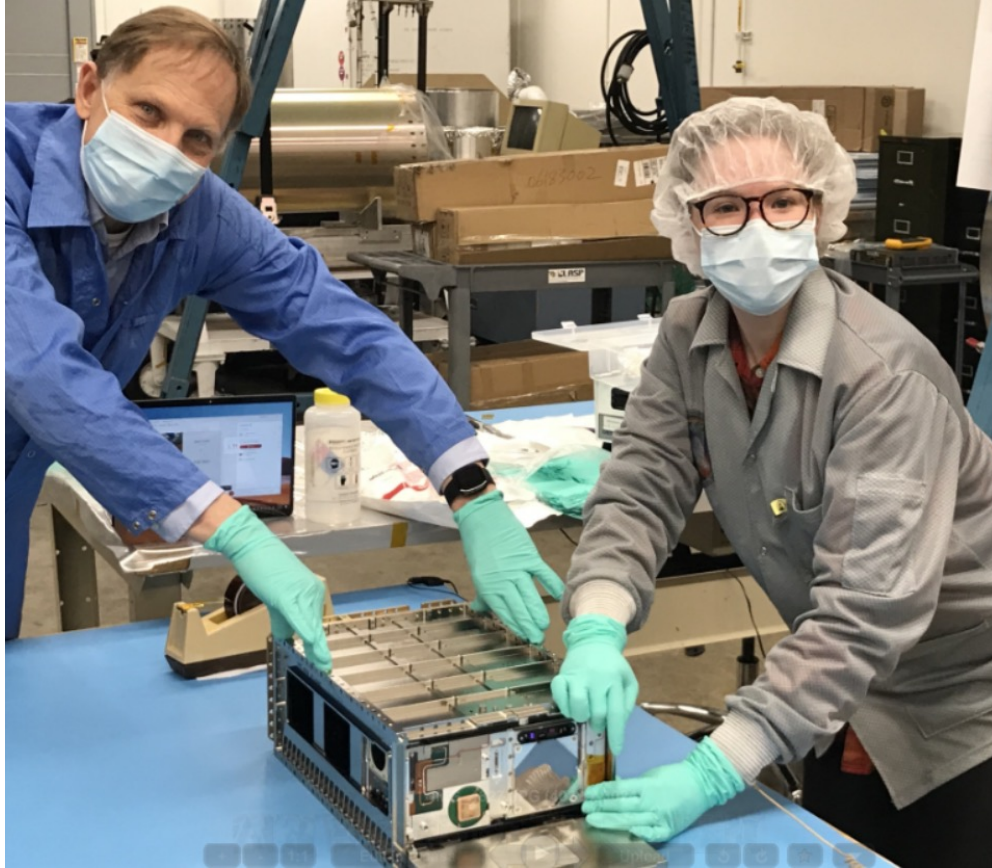
Apr. 17, 2021 – NASA's Neutron star Interior Composition Explorer (NICER), an X-ray telescope on the International Space Station, revealed that matter in the hearts of neutron stars – dense remnants of exploded massive stars – is less squeezable than some physicists predicted.

This showed that neutron stars are neutrons all the way down, and that the neutrons do not break into their own constituent parts, called quarks.

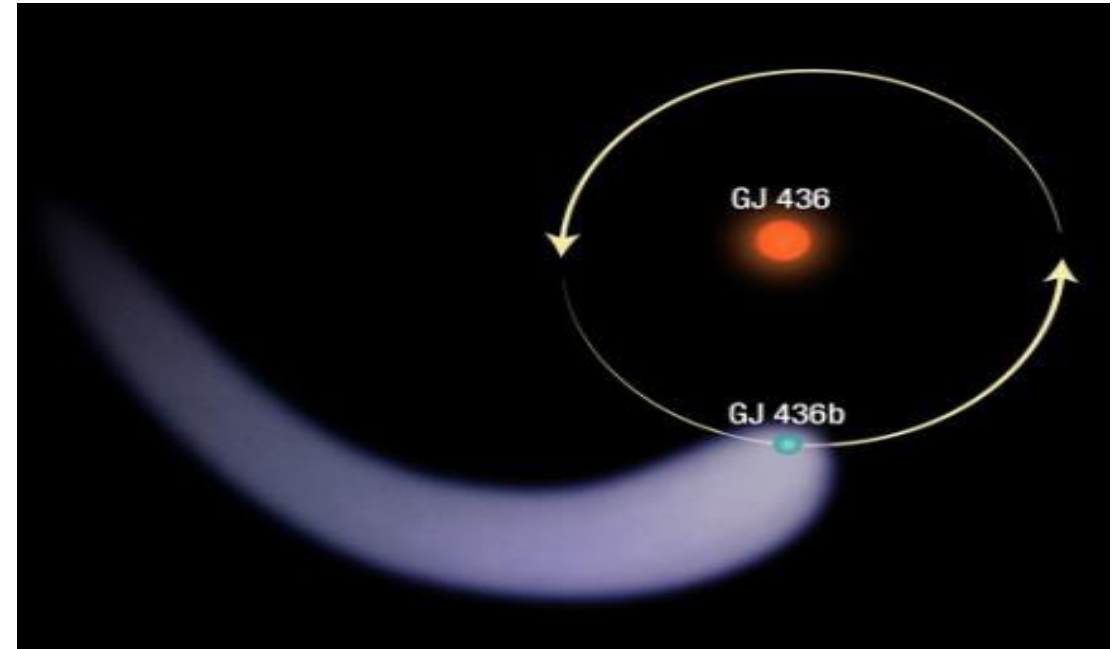


<https://www.nasa.gov/feature/goddard/2021/nasa-s-nicer-probes-the-squeezability-of-neutron-stars>

Colorado Ultraviolet Transit Experiment (CUTE)



Rick Kohnert (CUTE PM) and Arika Egan (CUTE lead grad student) fit check the assembled CUTE in deployment canister. Photo courtesy K. France



Science Objectives: The Colorado Ultraviolet Transit Experiment (CUTE) will take multiple medium resolution UV spectra of hot Jupiters during transit, in order to measure the composition of the atmosphere being ablated away. Magnetic fields may be detected via the presence of tori or bow shocks.

Launch scheduled for September 2021 as ride share with Landsat-9 primary payload

- Observatory integration and testing (I&T) ongoing at Ball Aerospace
- Observatory vibration, shock, and acoustic testing planned for late May / June 2021
- Observatory thermal/vacuum test planned for July 2021
- Observatory I&T completion planned for mid-Sept 2021
- Ship to Kennedy Space Center planned for mid-October 2021
- Current launch readiness date is November 17, 2021

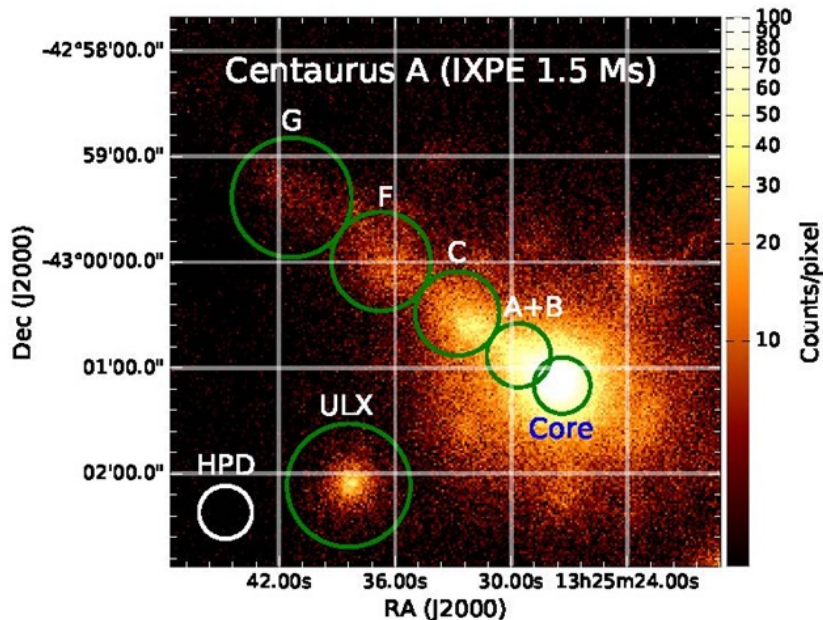
Imaging X-ray Polarimetry Explorer (IXPE)

Credit: Ball Aerospace

Imaging X-ray Polarimetry Explorer

- IXPE Science Objectives:

- Use X-ray polarimetric imaging to examine directly the magnetic-field topology of AGN jets.
- Perform X-ray spectral polarimetry on microquasars.
- Perform X-ray polarimetric imaging and phase-resolved polarimetry to study radio pulsars and pulsar-wind nebulae.
- Use X-ray polarimetric imaging to examine the magnetic-field topology of SNR.
- Perform X-ray phase-resolved spectral polarimetry of accreting X-ray pulsars.
- Test QED by performing X-ray phase-resolved polarimetry of magnetars



Overlay of IXPE polarimetric imaging fields (green) on the jet of Cen A.

- Data is immediately available to the public (no limited data access period).
- General Observer program will be added if there is an extended mission.

Webb Final Primary Mirror Wing Deployment



An image sequence showing the observatory completing its final deployment test in May of 2021. The primary mirror wings are gravity-offloaded for deployment tests on Earth.

Improving Inclusion at NASA



Inclusion – NASA is committed to a culture of diversity, inclusion, and equity, where all employees feel welcome, respected, and engaged. To achieve the greatest mission success, NASA embraces hiring, developing, and growing a diverse and inclusive workforce in a positive and safe work environment where individuals can be authentic. This value will enable NASA to attract the best talent, grow the capabilities of the entire workforce, and empower everyone to fully contribute.



Strategy 4.1: Increase the diversity of thought and backgrounds represented across the entire SMD portfolio through a more inclusive and accessible environment.

ROSES: SMD's goals are to develop a workforce and scientific community that reflects the diversity of the country and to instill a culture of inclusion across its entire portfolio.

Building Excellent NASA Teams Requires Inclusion and Diversity



- At NASA, we recognize that excellence is only achieved with inclusive and diverse teams. We are creating a multi-pronged approach.
 - Directorate level: Standing up a long-term activity focused on sustained engagement, systemic, and lasting changes. Hosting [incubator workshops](#) and implementing actions from those workshops focused on short-term changes to how we are operating and how we grow our leaders. [National Academies study of barriers to inclusion in mission leadership](#). [Adopting a Code of Conduct to improve the inclusion and process of our panels and teams](#).
 - Division level: Division task forces working to align division-level practices with the NASA core value and SMD science strategy. Examining the R&A process for better inclusion and diversity. [Piloting inclusion plans as an evaluation criterion for R&A programs](#). Workshop to increase interactions with Minority Serving Institutions.
- Proposal Processes: Recognizing we have influence through our calls for proposals and what we reward in our selections. [Piloting dual-anonymous peer review and seeking to expand that](#). Actively looking into how we can be a model for inclusivity. Working group modifying requirements for AOs to align with NASA's new core value of Inclusion.



ATP Inclusion Criterion Pilot Program

ROSES-21 will be amended to add the following change to the Astrophysics Theory Program (ATP)

All proposals should include an inclusion plan. This section will address:

- Plans for creating and sustaining a positive and inclusive working environment for those carrying out the proposed investigation, and
- Contributions the proposed investigation will make to the training and development of a diverse and inclusive scientific workforce.

The inclusion plan will be evaluated for adequacy and completeness. The evaluation of the inclusion plan includes the following factors:

- Does the inclusion plan adequately communicate the goal of a positive and inclusive working environment for the investigation team? Does the inclusion plan provide adequate processes for creating and sustaining a positive and inclusive working environment for the investigation team? Are these processes likely to be successful in achieving the goal.
- Does the inclusion plan adequately describe the contribution of the proposed investigation to the training and development of a diverse and inclusive workforce? Does the inclusion plan provide an adequate plan for achieving the identified contribution? Is the plan likely to be successful in realizing the identified contribution?

Feedback will be provided to the proposers as part of the panel review summaries. The feedback will not be folded into the adjectival ratings or selection recommendations in the current ROSES cycle, but may in future cycles. NASA plans to invite comments from proposers regarding this pilot process after they receive their review comments.

SMD Anti-Racism Action Group

Propose, collect & implement new and innovative ideas with well-defined and measurable outcomes

- Lead by SMD Associate Administrator
- Update all supervisor performance plans to require meaningful progress in IDEA-relevant performance goals
- Establish an engagement committee to build relationships with under-represented groups.
- Initiate series of internal culture surveys to baseline and measure progress in diversity and inclusion across SMD
- Collect and publicize current and historic aggregate demographic data of ROSES awardees
- Require that all panel reviews adopt code of conduct that reflects commitment to a diverse and inclusive working environment
- Set a goal for each SMD division to increase the aggregate demographic diversity of its reviewers in ROSES panels by the end of 2022



SMD Long-Term IDEA Working Group

Align outcomes and activities with NASA core value of inclusion and Science Strategy 4.1

- Lead by SMD Deputy AA for Management
- More than 50 SMD staff members (civil servants, IPAs, and contractors) in smaller groups
 - IDEA Programming, Outreach and Engagement
 - Missions/Projects/Programs
 - Leadership Development & Growth
 - Inclusion/Culture
 - Recruitment/Hiring/Promotion/Retention
 - Research & Analysis

COVID Impacts: Status of SMD Programs

NASA has been in a mandatory telework posture due to COVID-19 for over one year now; NASA work has continued though there have been impacts

COVID Impacts on Missions:

- Projects continue to respond and replan due to changes due to COVID-caused issues; replans (including changes in cost and schedule estimates) continue to be reviewed and approved through the SMD Program Management Council process
- NASA Centers are planning for ramping up onsite activities when 25% occupancy limit is lifted
- SMD COVID assumptions have been updated, which allows our missions to more effectively plan for operating over the next 12 months

COVID Impacts on R&A:

- No R&A solicitations or selections have been cancelled due to COVID; notifications and funding have continued at the pre-pandemic pace
- Virtual peer review panels will continue through December 2021, and likely beyond

How this affects the community:

- As vaccinations increase within the community, we will be able to interact more with our project teams, partners, and vendors by increasing on-site work and travel
- SMD is working toward multiple launches scheduled for the fall and winter of this year, including Webb, Lucy, Landsat-9, DART, IXPE, and GOES-T



Supporting Work-Life Balance

- SMD recognizes the importance of balancing one's work with the requirements of one's family, friends and personal physical and mental health
- We have created a web page to inform SMD-funded researchers about NASA-provided wellness resources and leave options that may be available

<https://science.nasa.gov/researchers/work-life-balance>

- The web page discusses resources and flexibilities for
 - Recipients of NASA grants and cooperative agreements
 - NASA Civil Servant Scientists
 - NASA on-site contractors
 - NASA Postdoctoral Program Fellows
- The resources that one may access depend on one's relationship with NASA (above) and one's institution's policies
- One's first step, regardless of your relationship to NASA, should be to contact your institution's Office of Sponsored Programs, Human Resources or Human Capital Office to determine your employer's policies
 - NPP Fellows should contact their NPP Center Representative
- Please help us improve this webpage by sending suggestions, questions and feedback to sara@nasa.gov



The NASA Team



Administrator Sen. Bill Nelson



Sen. Bill Nelson was sworn in as the 14th NASA administrator on May 3, 2021, tasked with carrying out the Biden-Harris administration's vision for the agency. Nelson served in the U.S. Senate for 18 years from Florida and as a payload specialist on space shuttle mission 61-C in 1986.



In this May 20, 2021 photo, Pam Melroy addresses members of the Senate Commerce, Science and Transportation Committee during her confirmation hearing at the Hart Senate Office Building in Washington. Melroy, a former astronaut, was nominated by President Biden to serve as the next deputy administrator of NASA.

NASA Astrophysics Division

Division Director



Paul Hertz
Astrophysics Division
Director



Jeff Volosin
Astrophysics Division
Deputy Director



Program Executives



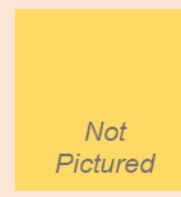
E. Lucien Cox
SOFIA, GUSTO,
XRISM, ExEP



Ed Griego
Roman CGI, APD
Operating Missions



Shahid Habib
COR, PCOS, ARIEL,
Athena, Euclid, LISA,
UltraSat



Future



Janet Letchworth
Roman



Mark Sistilli
Explorers Program
IXPE, SPHEREx
Balloons

Cross Cutting



Eric Smith
Chief Scientist
Webb



Jeanne Davis
Assoc Dir for Flight
ASM Program Manager



Mario Perez
Chief Technologist
SAT, RTF

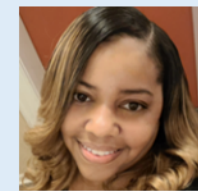


Lisa Wainio
Information Manager,
Public Affairs Liaison

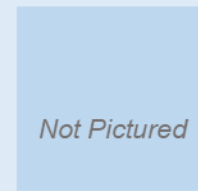
Administrative Support



Kelly Johnson
Administrative Assistant



Maria Washington
Administrative Assistant



Jackie Mackall
Program Support
Specialist



Ingrid Farrell
Program Support
Specialist

Program Scientists



Dominic Benford
Roman
APRA Lead



Valerie Connaughton
APRA (High Energy)
XRISM, UltraSat,
PCOS Program



Future



Michael Garcia
APRA (UV/Optical),
SmallSats/Pioneers
Hubble, Athena



Thomas Hams
APRA (CR, Fund. Phys.)
Rockets/Balloons
GUSTO, LISA



Hashima Hasan
Education/Comms, Citizen
Science, Archives,
Advisory Committees,
NuSTAR, Keck



Douglas Hudgins
ExEP Program
ADAP Lead
TESS, ARIEL



Stefan Immler
Astrophysics Research
Program Mgr, Chandra,
XMM



Hannah Jang-Condell
XRP, FINESST,
ExEP, TESS



Patricia Knezek
Astrophysics Explorers
Program, SOFIA,
Hubble Fellows



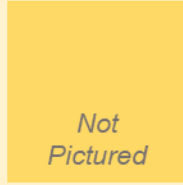
William Latter
APRA (Lab Astro)
Spitzer, SPHEREx,
Fermi



Future



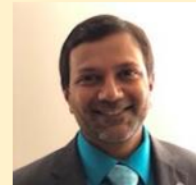
Roopesh Ojha
Data Lead
NICER, FINESST



Future



Evan Scannapieco
ATP / TCAN Lead,
Swift



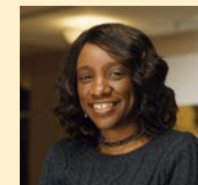
Kartik Sheth
COR Program,
Senior Review,
Inclusion/Diversity



Linda Sparke
On detail to the Office
of the Administrator



Eric Tollestrup
APRA (IR/Submm)
Euclid, IXPE



Heather Watson
Dep. Technologist,
Explorers,
SmallSats/Pioneers



Future

Join the Astrophysics Team at NASA Headquarters

NASA seeks visiting Ph.D.-level scientists to serve as Program Scientists in the Astrophysics Division at NASA Headquarters in Washington, DC. With a budget of \$1.8 billion annually, the Division is responsible for the nation's space-based astrophysics program.

NASA Program Scientists

- manage scientific research grants programs and the proposal review process;
- serve as the Headquarters science lead for missions;
- implement NASA's response to the 2020 Decadal Survey;
- gain insight into federal astrophysics policy and programs;
- run scientific programs with multimillion-dollar budgets, and
- contribute to a culture of diversity, equity, and inclusion.

Visiting appointments last two years with renewals up to six years.

Positions are available from Fall 2021, though the start date is flexible. Applicants should email a curriculum vitae and cover letter as a single PDF file ASAP but no later than August 6, 2021 to hq-astrophysics-ipasearch@mail.nasa.gov. Decisions will be made on a rolling basis. For more information about the position, please contact Dr. Hannah Jang-Condell at hannah.jang-condell@nasa.gov.

Please feel free to speak to any of us from HQ during this meeting about this opportunity.

<https://jobregister.aas.org/ad/6838d5ef>

NASA Town Halls and Special Sessions



238



238TH MEETING OF THE AMERICAN
ASTRONOMICAL SOCIETY
VIRTUALLY ANYWHERE 7 – 9 JUNE 2021

Town Halls and Special Sessions	Session	Date and Time
NASA Town Hall	117	Monday, Jun 7 @ 1:40 pm ET
STScI Town Hall	217	Tuesday, Jun 8 @ 1:40 pm ET
Webb Space Telescope Ready for Launch	305	Wednesday, Jun 9 @ 12:00 pm ET
New NASA Science Mission Directorate Scientific Information Policy	Splinter	Wednesday, Jun 9 @ 12:00 pm ET



Keep Connected with NASA

NSPIRES mailing list – information about NASA solicitations

<https://nspires.nasaprs.com/>

Cosmic Origins mailing list, Exoplanet Exploration mailing list, Physics of the Cosmos mailing list – information about NASA missions and science

<https://cor.gsfc.nasa.gov/cornews-mailing-list.php>

<https://exoplanets.nasa.gov/exep/exopag/announcementList/>

<https://pcos.gsfc.nasa.gov/pcosnews-mailing-list.php>

NASA Astrophysics Federal Advisory Committees

Astrophysics Advisory Committee (APAC)

<https://science.nasa.gov/researchers/nac/science-advisory-committees/apac>

NASEM Committee on Astronomy and Astrophysics (CAA)

http://sites.nationalacademies.org/bpa/bpa_048755

Astronomy and Astrophysics Advisory Committee (AAAC)

<https://www.nsf.gov/mps/ast/aaac.jsp>

Sign up to be a panel reviewer:

<https://science.nasa.gov/researchers/volunteer-review-panels>



Research Program Update



COVID-19 Mitigations for R&A

NASA does not want the pandemic to derail careers of future leaders; we are focused on mitigating impacts

Within current funding constraints, NASA will prioritize augmentations and funded extension requests for existing awards

- NASA issued a ROSES call for funded extensions (ROSES-20, Appendix E.10)

- This initiative is funded from the current R&A Program; size of commitment is approximately 15% of funding available for new awards in FY21. There will be 15% fewer new awards in FY21

- Received 32 COVID recovery funding extension requests in Astrophysics for a total of ~\$5.7M. Selected 26 for \$3.2M, with 2 requests pending.

Within current funding constraints, SMD will continue to support 124 NASA Postdoctoral Program (NPP) fellowships

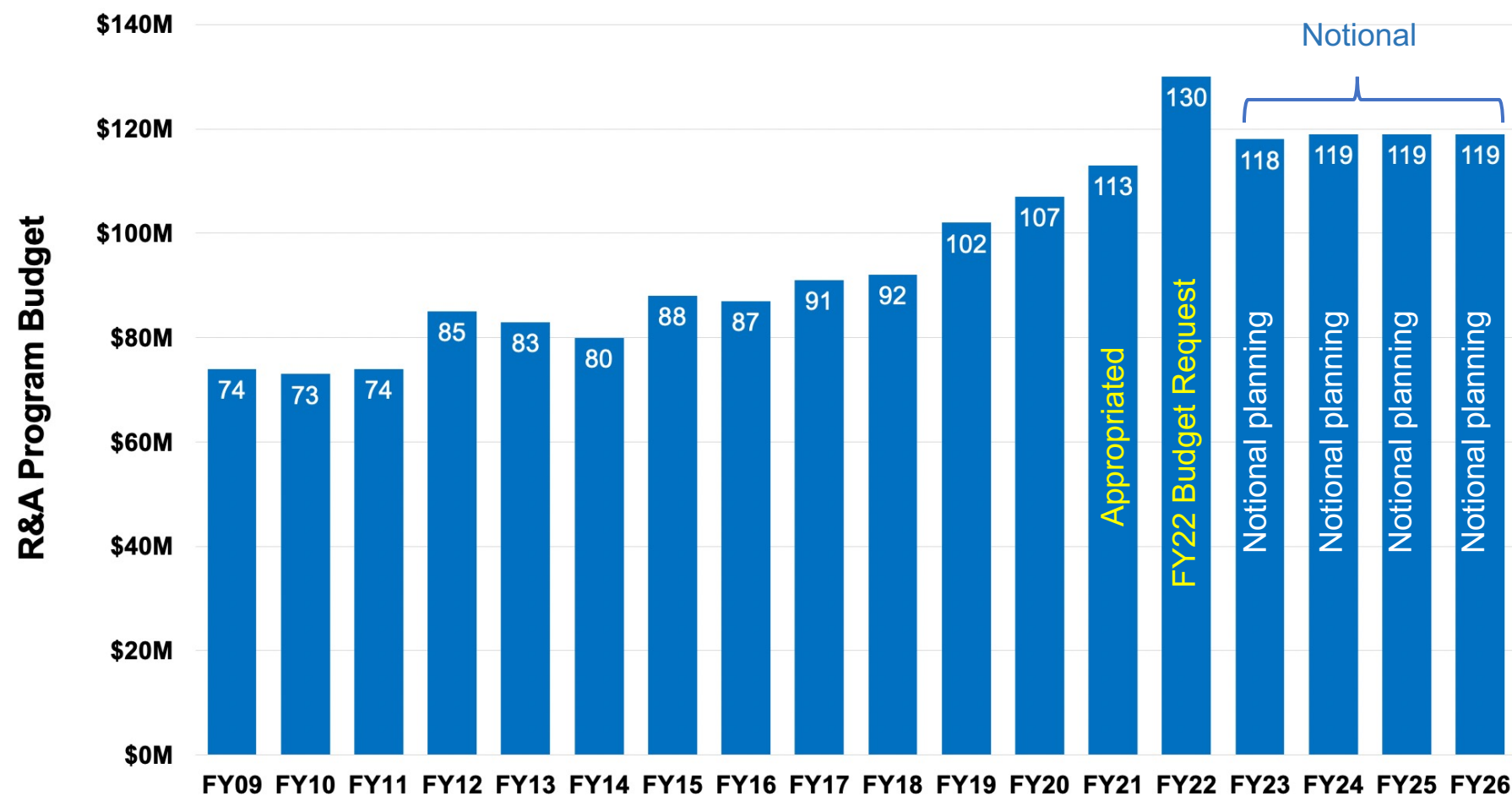
- The July 2021 call is limited to applicants who already have permission to work in the US because of the inaccessibility of J-1 visas

- Since some slots will be used to extend current Fellows, SMD will supplement the funding for the NPP to maintain the pre-existing competitive level

Government-wide flexibility for paying salaries of researchers, even if they could not work because of COVID, expired on September 30. NASA has established a process to consider extending this flexibility to pay salaries on a case-by-case basis

<https://science.nasa.gov/researchers/covid-and-awards>

R&A Research Funding



Since the last Decadal Survey:

+38% R&A funding growth

Notional Planning:

+60% over 17 years.

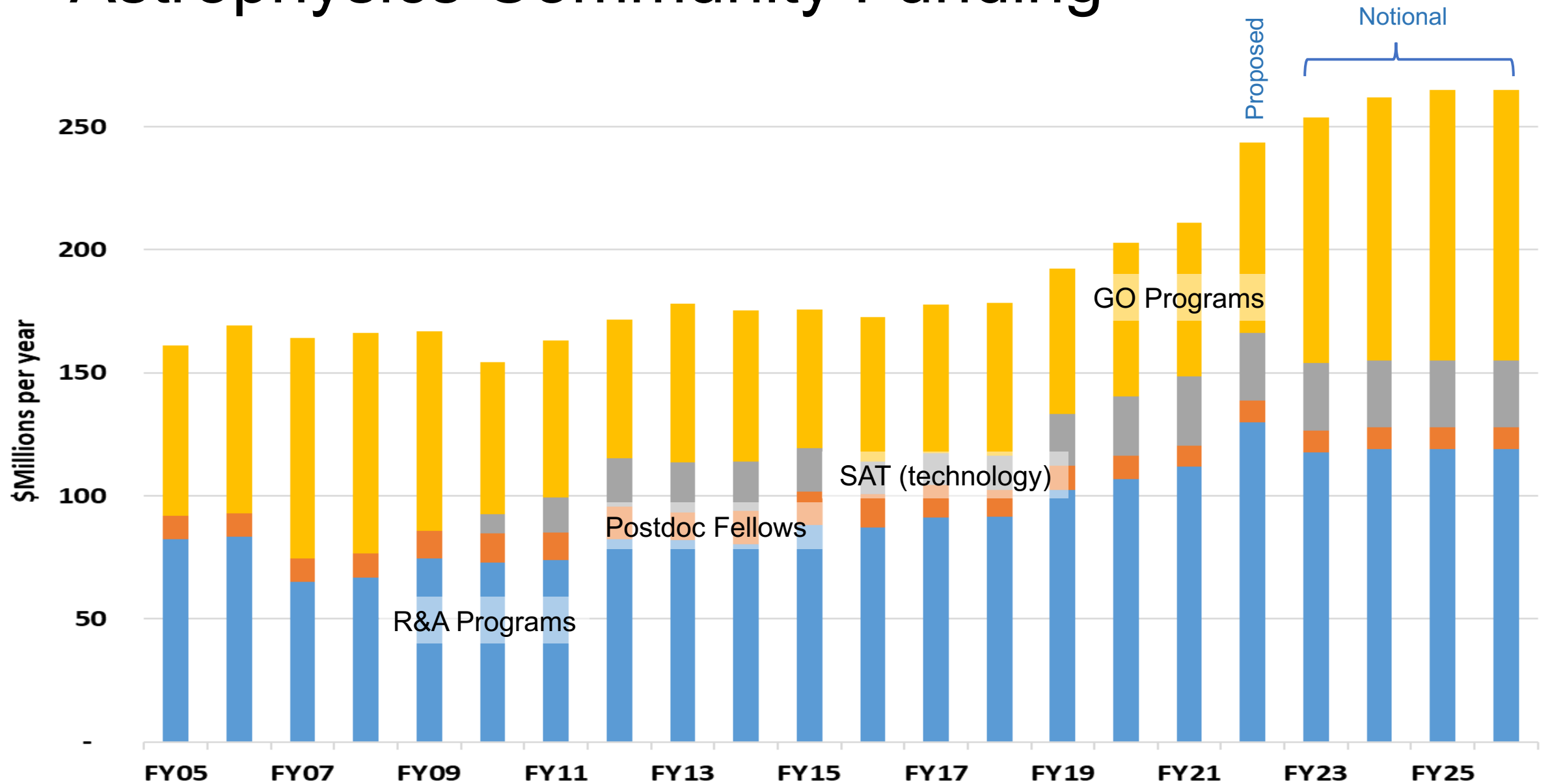
Includes:

APRA, ADAP, XRP, ATP, TCAN,
FINESST, RTF, CubeSats,
SmallSat studies

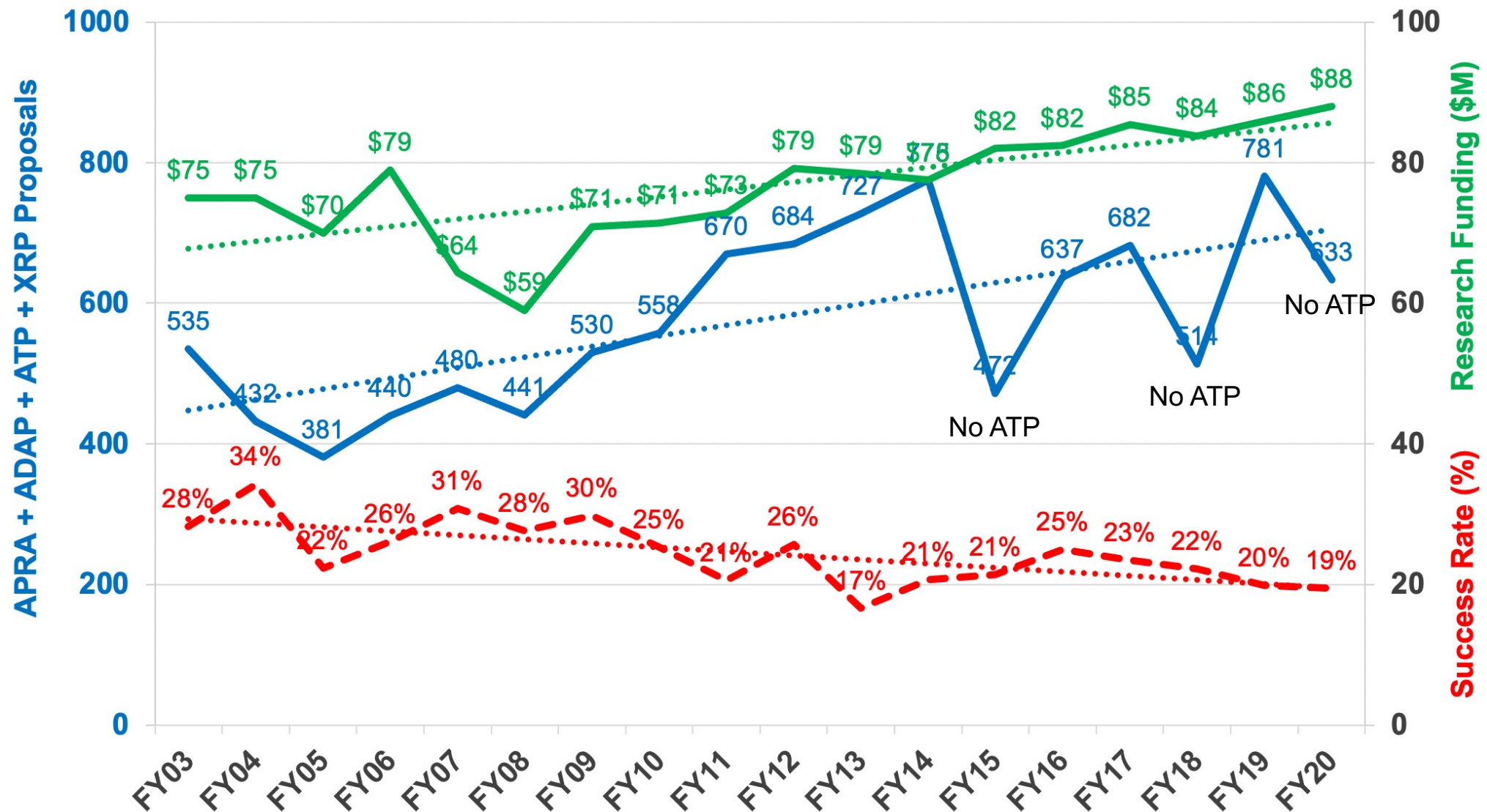
+ GO/GI Programs for missions

Sustained growth in R&A research funding since the 2010 Decadal Survey

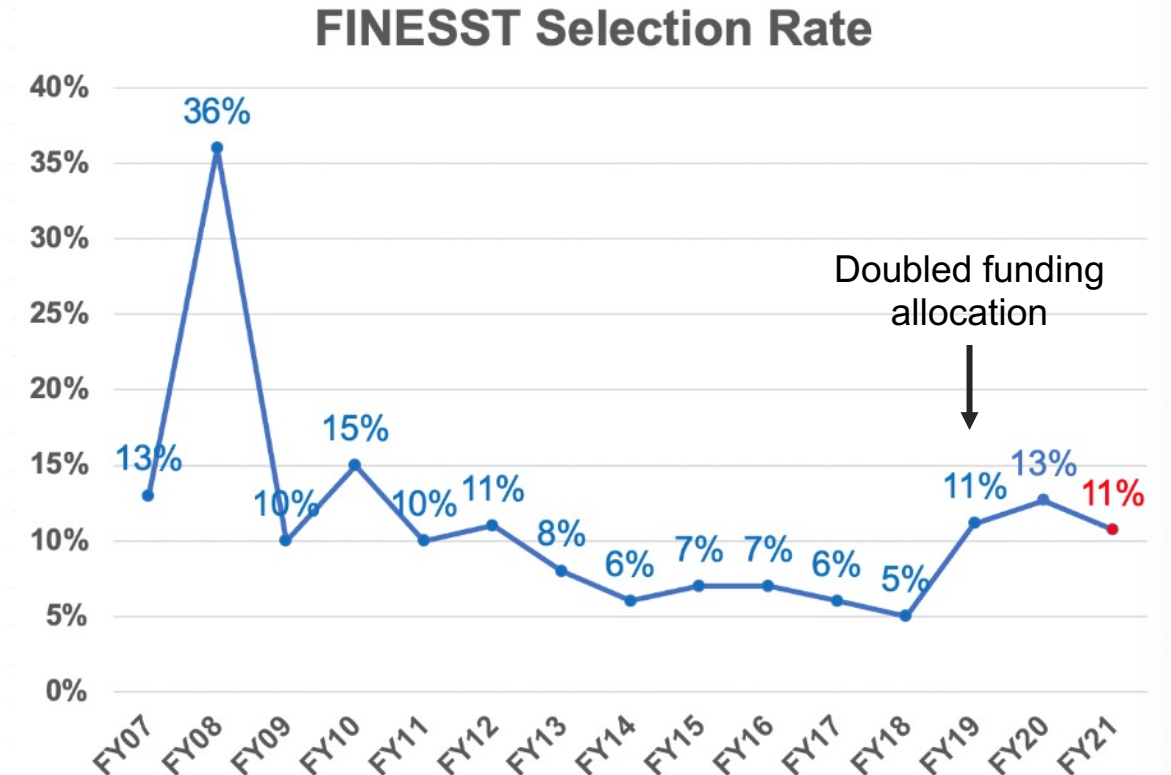
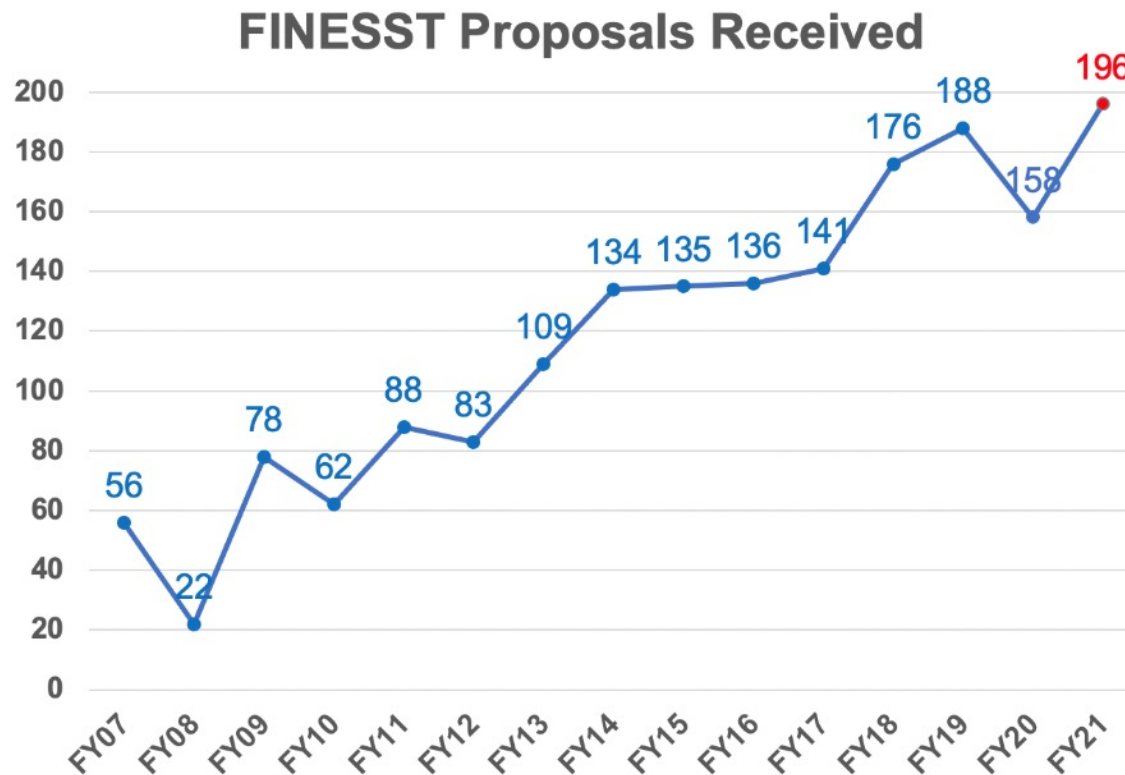
Astrophysics Community Funding



R&A Proposals, Research Funding, Success Rate



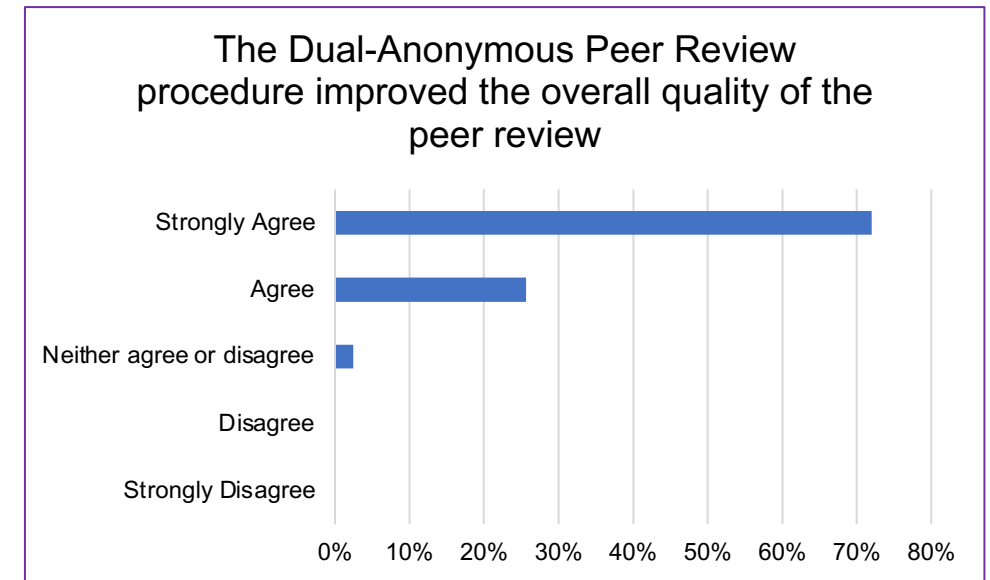
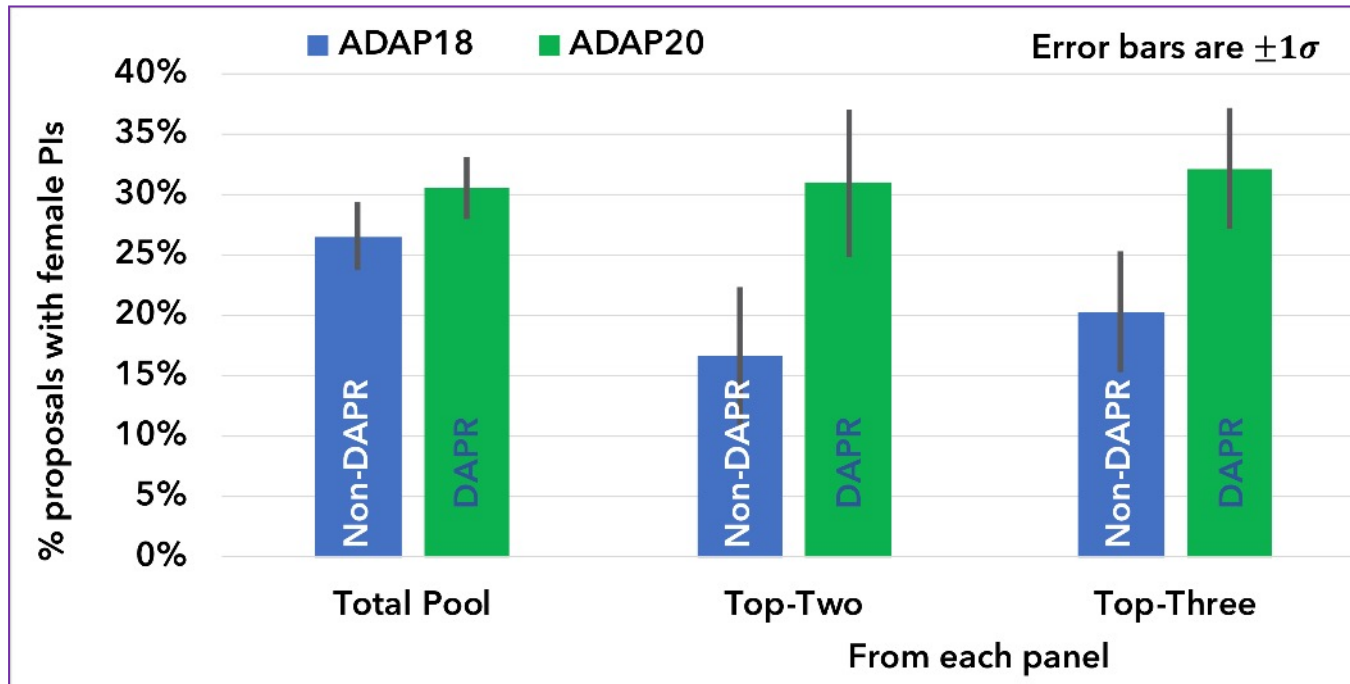
Future Investigators in Earth and Space Science and Technology (FINESST) (graduate student research program)



This year's selection: 21 new FIs, 57% inferred female, 43% male students from 19 unique universities in 13 states

Dual-Anonymous Peer Review

- Dual-Anonymous Peer Review (DAPR) has successfully been used in multiple Astrophysics programs
- All Astrophysics GO/GI programs have permanently converted
- Astrophysics Data Analysis and Habitable Worlds among ROSES programs converted in 2020
- Will be joined by Exoplanet Research and Astrophysics Theory programs in ROSES-2021



Recent R&A Initiatives

- Pioneers: Established new program for <\$20M SmallSats, balloons, ISS payloads
- Exoplanet Research Program (XRP) Consolidation: All exoplanet investigations under XRP, ramping up funding
- Laboratory Astrophysics: Capital equipment purchases eligible for APRA starting in ROSES-20
- FINESST: Doubled funding and selection rate for graduate student program
- Diversity of Proposing Teams: Pilot program for this year's Astrophysics Theory Program (ATP) to require an inclusion plan
- Citizen Science: SMD solicitation for Citizen Science seed funding
- Data Management Plan: Now part of the intrinsic merit evaluation of proposals
- High Risk / High Impact: Assessed for all proposals and forwarded to SMD blue ribbon panel
- Code of Conduct for Peer Reviews: Astrophysics code is now adopted for all SMD reviews
- Inclusion, Diversity, Equity, and Accessibility: Established IDEA taskforce for Astrophysics R&A, implementing recommendations of SMD's Anti-Racism Action Group

From Open Data to Open Science

All NASA mission science data are public

Publications funded by NASA, including peer review journal articles, are open access and freely available to the public

NASA has initiated an open science data initiative with targeted investments in cloud computing, open-source software, Artificial Intelligence/Machine Learning, etc.

- Includes ROSES calls targeted at supporting open-source tool development and the opening of legacy software

NASA is developing a policy to ensure that the results of its Federally funded scientific research and technology development are shared openly; this policy will cover:

- Information produced by NASA Science Missions
- Information produced by NASA research awards
- NASA-funded publications, data, and software

Draft will be released for public comment

Splinter Session: The New NASA Science Mission Directorate Scientific Information Policy
Wednesday, Jun 9 @ 12:00-1:30 pm ET

Agenda: Introduction / Planetary Sciences / Heliophysics / Astrophysics / Discussion

Ask and upvote questions at <https://arc.cnf.io/sessions/r8zx/#!/dashboard>



Citizen Science

Citizen Science is a form of open collaboration in which individuals participate voluntarily in the scientific process – Citizen Science is a science investigation that relies on volunteers

Current astrophysics projects at <https://science.nasa.gov/citizenscience> include

- Backyard Worlds: Planet 9 project at <https://backyardworlds.org>
- Disk Detective at <https://www.zooniverse.org/projects/ssilverberg/disk-detective>
- Planet Hunters TESS at <https://www.zooniverse.org/projects/nora-dot-eisner/planet-hunters-tesse>
- Planet Patrol at <https://exoplanetpatrol.org>

Proposers to any ROSES program element may incorporate citizen science and crowdsourcing methodologies into proposals

- XRP proposal selected: A Uniform Catalog of Planets from TESS Full Frame Images

Citizen Science Seed Funding Program in ROSES funds prototyping of citizen science projects offered. Four astrophysics citizen science proposals selected from ROSES-20

- Disk Detective v2.0: Identifying Unusual Circumstellar Disks Via Citizen Science
- 'Backyard Worlds: Cool Neighbors' - Discovering Brown Dwarfs through Citizen Science
- Redshift Wrangler: Citizen Science Analysis of Extragalactic Spectroscopy
- Leveraging a Zooniverse Discovery to Diagnose a Dominant Mode of Star Formation and Provide a CURE for Introductory Astronomy Students

Citizen Seed Funding proposals in ROSES-21 due December 15, 2021

Citizen Science – High School Edition

- “Using Proper Motions from CatWISE2020 to Uncover New Objects in the Solar Neighborhood”
- Press Conference: Wednesday, June 9, 12:15 p.m. ET
- Discovery of brown dwarfs, led by a high school student citizen scientist
 - Tarun Kota, Eastview High School, Apple Valley, Minnesota
 - With guidance from J. Davy Kirkpatrick, Caltech/IPAC
- Leverages CatWISE2020 – a NASA-funded catalog of objects from NASA’s WISE and NEOWISE
- The NASA-funded “Backyard Worlds: Planet 9” project lets anyone join the quest to find more mysterious objects in spacecraft data





Why Volunteer to Serve on a NASA Peer Review Panel?

Personal professional development:

- See how the whole review process works
- Learn what constitutes excellent proposals
- Network with your professional colleagues and NASA scientific staff

Institutional achievement:

- Improve at competing for NASA money
- Increase knowledge of NASA's research and technology programs

Investment in the future:

- Help select the most transformative science
- Ensure that all proposals receive a fair and competent review

All reviewers receive an honorarium from NASA

All reviews through (at least) the end of 2021 are virtual

Sign up to be a panel reviewer:

<https://science.nasa.gov/researchers/volunteer-review-panels>

or contact a NASA program officer (for contact info, see

<https://science.nasa.gov/researchers/sara/program-officers-list>)



Mission Program Update

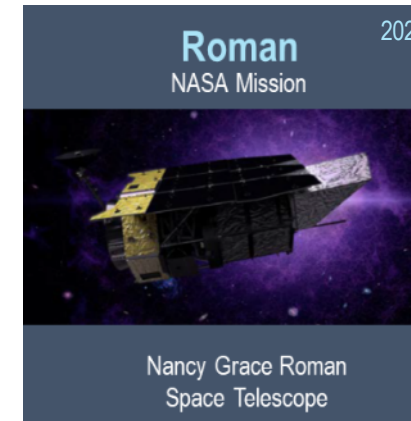


Astrophysics Missions in Operations

<p>Hubble^{4/90} NASA Strategic Mission</p>  <p>Operations Nominal</p>	<p>Chandra^{7/99} NASA Strategic Mission</p>  <p>Operations Nominal</p>	<p>XMM-Newton^{12/99} ESA-led Mission</p>  <p>Operations Nominal (ESA)</p>	<p>Gehrels Swift^{11/04} NASA MIDEX Mission</p>  <p>Operations Nominal</p>	<p>Fermi^{6/08} NASA Strategic Mission</p>  <p>Operations Nominal</p>	<p>NuSTAR^{6/12} NASA SMEX Mission</p>  <p>Operations Nominal</p>
<p>SOFIA^{5/14} NASA Strategic Mission</p>  <p>Operations Nominal</p>	<p>ISS-NICER^{6/17} NASA Explorers Miss. of Oppty</p>  <p>Operations Nominal</p>	<p>TESS^{4/18} NASA MIDEX Mission</p>  <p>Operations Nominal</p>	<p>Balloon Program Four Campaigns per Year</p>  <p>Operations Resumed Spring 2021</p>	<p>Sounding Rockets Worldwide Campaigns</p>  <p>Operations Nominal</p>	<p>Data Archives HEASARC, IPAC, MAST, etc.</p>  <p>Operations Nominal</p>

Next Senior Review is in 2022

Astrophysics Missions in Development



Launch dates are current project working dates; Agency Baseline Commitment launch date could be later; impacts of COVID-19 not yet known

COVID-19 Impacts – Missions

Many missions are expected to stay within their cost commitments (known as the ABC or Agency Baseline Commitment, which includes HQ held reserves above project budget)

- ABC is set at Confirmation Review

Some missions have experienced challenges that affect cost and schedule commitments

- In astrophysics, this includes Webb, Roman, and IXPE
- Missions that have been Confirmed since COVID began (e.g., SPHEREx), or will be Confirmed in the future (e.g., future Explorers) have assumed impacts from COVID included within their cost and schedule commitments

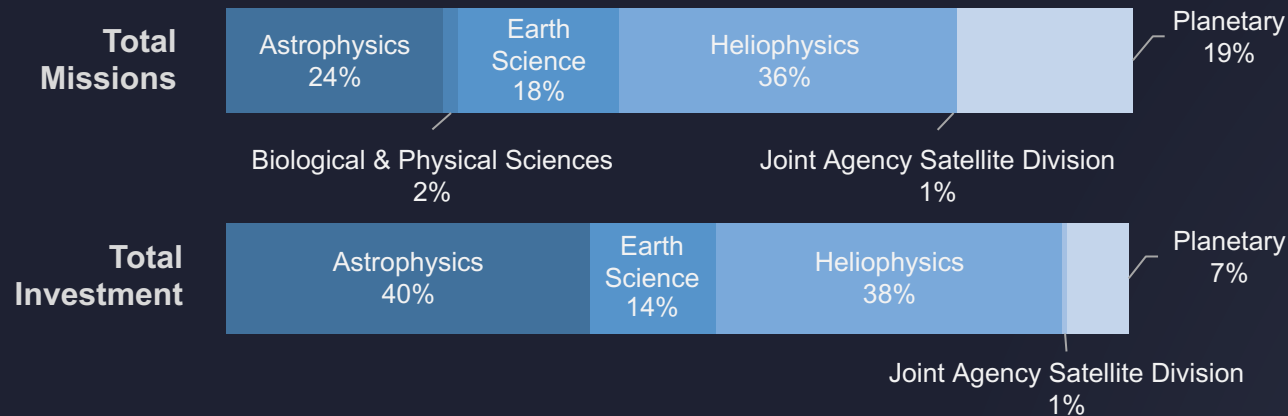
To date, challenges to Flagships (Webb, Roman) have been accommodated with no impact to Explorers or R&A

- Challenges to Explorers are accommodated within the Explorers Program

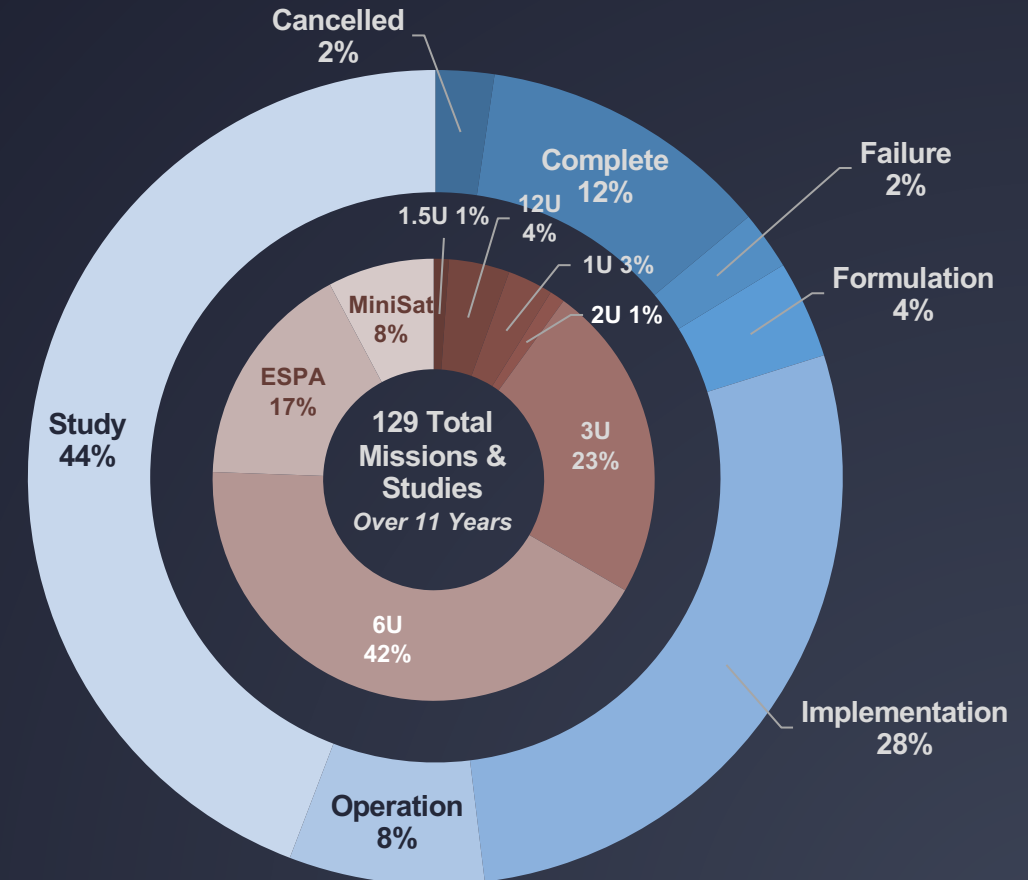
Mission impacts to commitments due to COVID (only missions with commitments)			
Webb	Exceeds schedule	XRISM	Does not exceed
IXPE	Exceeds cost and schedule	SPHEREx	Included in commitment
GUSTO	Does not exceed	Roman	Exceeds cost and schedule
Euclid	Does not exceed		

NASA's Small Satellite Missions at a Glance

SmallSat/CubeSat Missions & Investment by SMD Division



Mission Phase and Satellite Size



Mission Launch Timelines



\$2.27 B
Total Investment over 11 Years

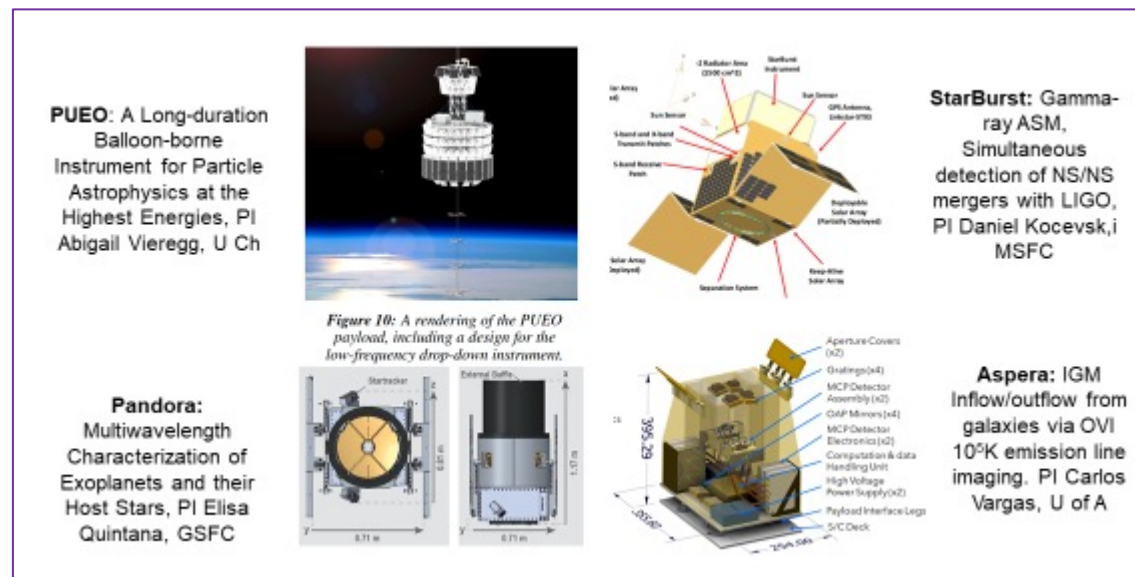
41 SMD SmallSat Missions
(64 Spacecraft)
in Implementation
2021 and beyond

Astrophysics Mission Classes

DECADAL SURVEY	EXPLORER AO	SALMON AO	ROSES	
>\$1B	\$450M	\$80M	\$20M	\$0
<div>>\$1B</div> <div>LARGE CLASS</div> <div>Great Observatory or Flagship</div>	<div>~450M</div> <div>SMALL CLASS</div> <div>Medium Explorer (MIDEX) PICC \$290M*</div>	<div>\$80M</div> <div>SMALL CLASS</div> <div>Standard Mission of Opportunity **</div>	<div>\$20M</div> <div>SMALL CLASS</div> <div>Pioneers SmallSat **</div>	<div>\$20M</div> <div>SUBORBITAL</div> <div>Pioneers Balloon</div>
<div>~\$1B</div> <div>MEDIUM CLASS</div> <div>Probe</div>	<div>~225M</div> <div>SMALL CLASS</div> <div>Small Explorer (SMEX) PICC \$145M*</div>	<div>\$40M</div> <div>SMALL CLASS</div> <div>SmallSat Mission of Opportunity **</div>	<div>\$5M</div> <div>SMALL CLASS</div> <div>APRA CubeSat</div>	<div>\$10M</div> <div>SUBORBITAL</div> <div>APRA Balloon</div>
				<div>\$5M</div> <div>SUBORBITAL</div> <div>APRA Sounding Rocket</div>

Astrophysics Pioneers

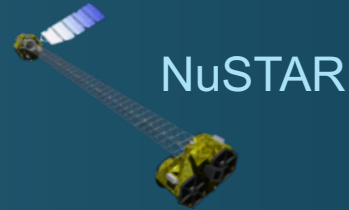
- A new class of small missions offered for first time in ROSES-2020. Include SmallSats, CubeSats >6U, major balloon payloads, modest ISS attached payloads, and lunar surface CLPS payloads. \$20M maximum PI cost cap.
- Fills in the gap between existing ROSES investigations (<\$10M for APRA) and existing Explorers MO investigations (~\$35M for SmallSats).
- Solicited through ROSES; relieves burden of writing full Explorers MO proposal (ROSES 2021 Amendment D.15).



- First four selections in January 2020.
- Teams working on Concept Study Report; first gate decision to proceed will be in January 2022.

- ROSES-2021 due date NET March 2022

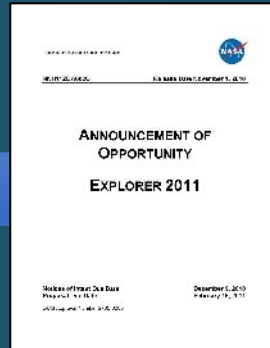
Astrophysics Explorers Program



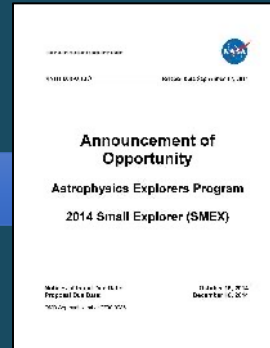
SMEX 2019 Downselect
Phase A Studies due Mar 4, 2021
Downselect decision Fall 2021

MIDEX 2021
Comm Ann release Sep 29, 2020
Draft AO release Jan 6, 2021
Comments due Feb 25, 2021
Final AO release August 2021
NOIs due October 2021
Proposals due December 2021
ALL FUTURE DATES TARGETS

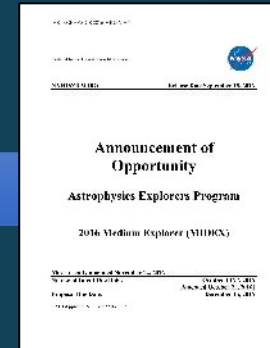
4 AOs per decade



MIDEX
2011



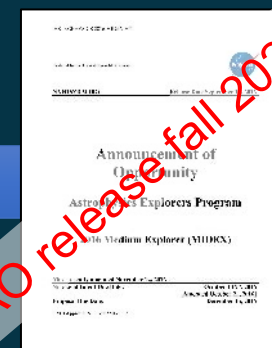
SMEX
2014



MIDEX
2016

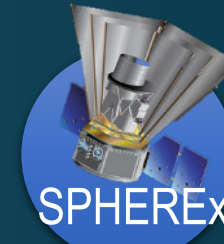


SMEX
2019



MIDEX
2021

Small and
Mid-Size
Missions



Missions of
Opportunity



James Webb Space Telescope

A large, yellow, hexagonal-shaped telescope structure is suspended by cables in a large, industrial cleanroom. The structure is composed of many yellow hexagonal panels. A black rectangular instrument is mounted on the side. The background shows the cleanroom's ceiling with lights and structural elements.

2021 Accomplishments

- All Observatory deployments – post launch environmental testing – successfully completed.
- Selected Webb Cycle 1 GO observing program
- Continued conducting mission rehearsals at the mission operation center (STScI) of greater length and fidelity

2021 Plans

- Reinstall repaired S-band transponders at the end of June and regression test them
- Complete final stow for launch steps
- Pack observatory for shipping to launch site
- Launch October 2021

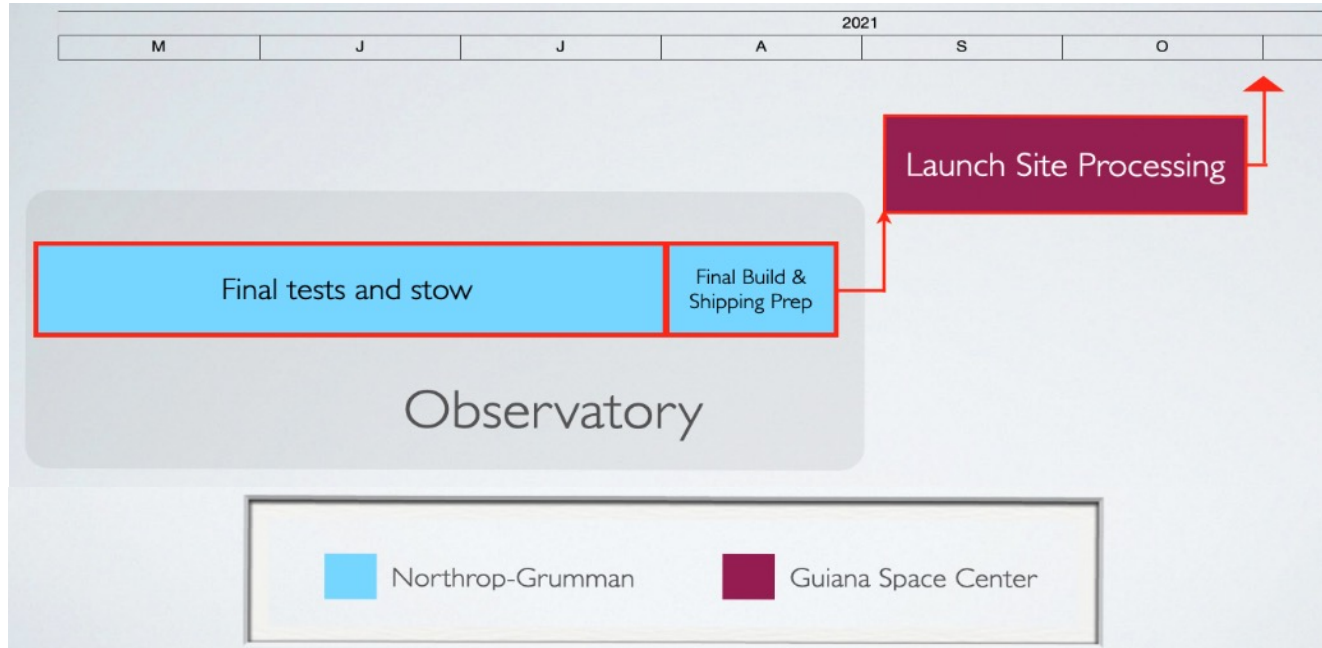
Special Session: ^S
Webb Space
Telescope Ready for
Launch
Session 305
Wednesday, Jun 9
@ 12:00-1:30 pm ET

Webb Final Primary Mirror Wing Deployment

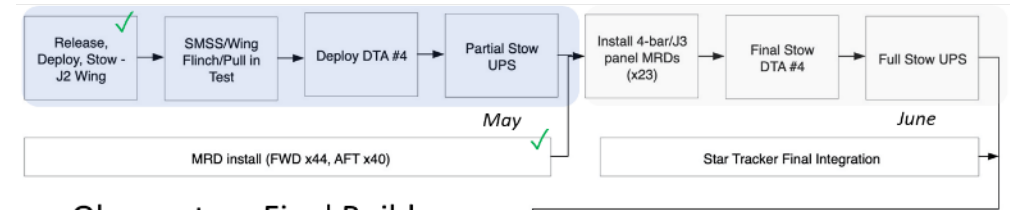


An image sequence showing the observatory completing its final deployment test in May of 2021. The primary mirror wings are gravity-offloaded for deployment tests on Earth.

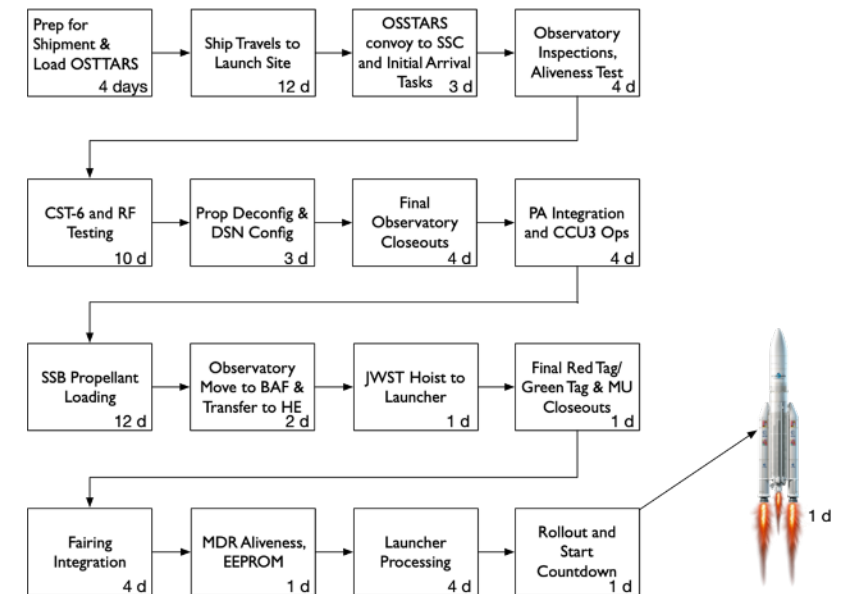
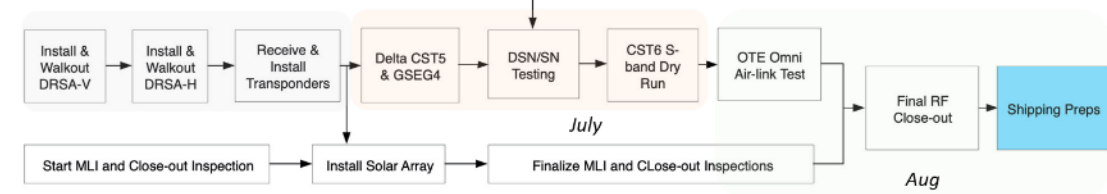
Webb Schedule



Observatory Deployments



Observatory Final Build



Nancy Grace Roman Space Telescope

Roman Science Interest Group (RSIG) formed to provide broad-based community input to the Roman project and NASA Headquarters

Good technical progress has been made in spite of COVID inefficiencies and supply chain impacts

Critical design reviews (CDR) for telescope, wide field instrument, coronagraph, and instrument carrier have been completed; ground system CDR to be completed by July 2021

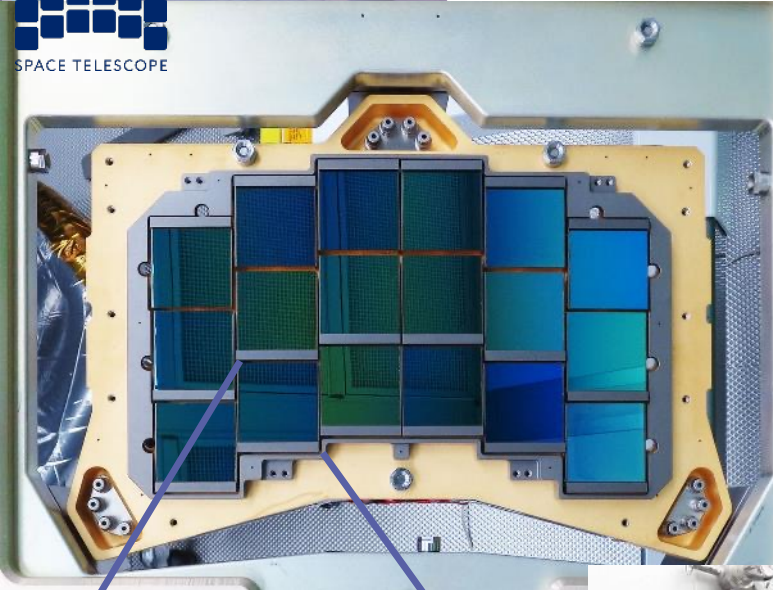
Mission CDR to be completed by September 2021

Complete telescope by the end of 2021

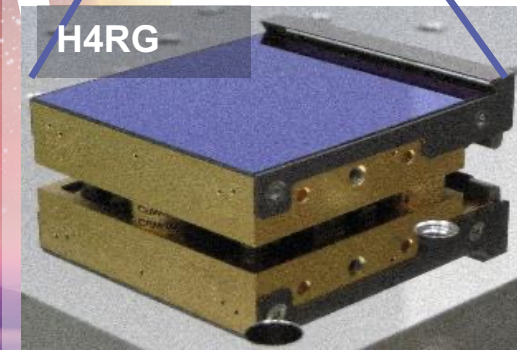
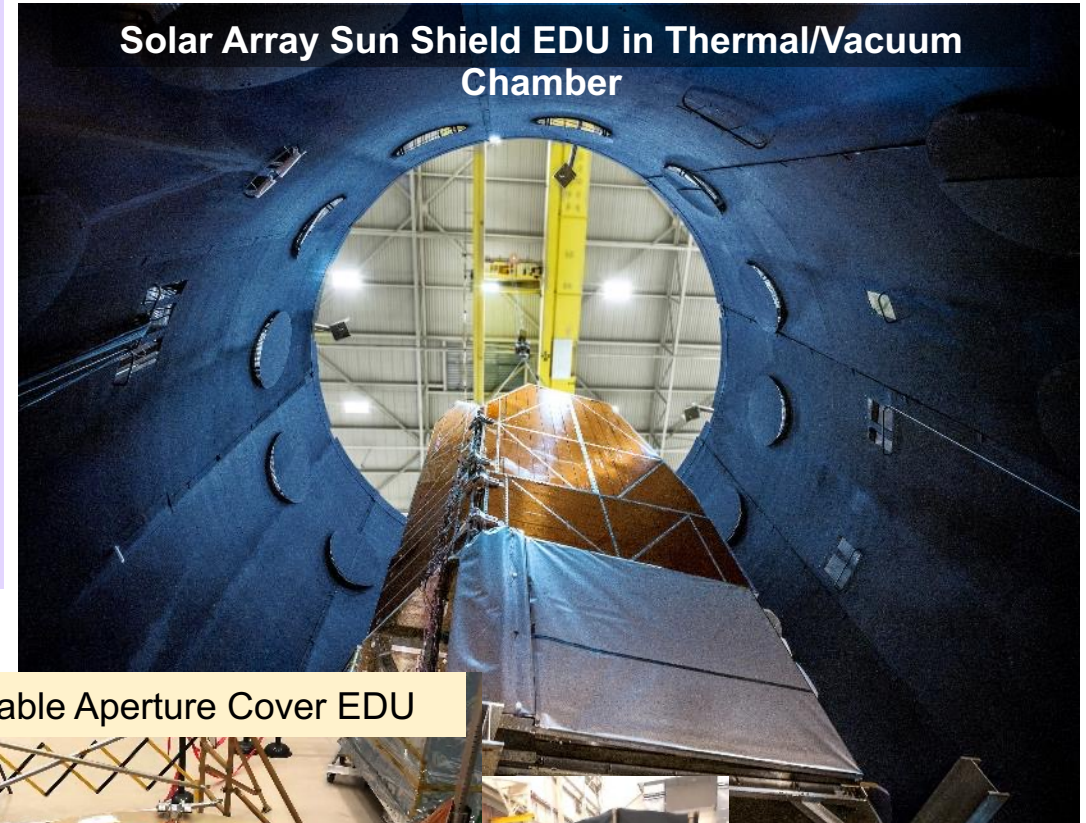
Replan to adjust cost and schedule commitments was completed in late May 2021

Opportunities for participation in Roman Space Telescope research and support will be offered in ROSES-2021

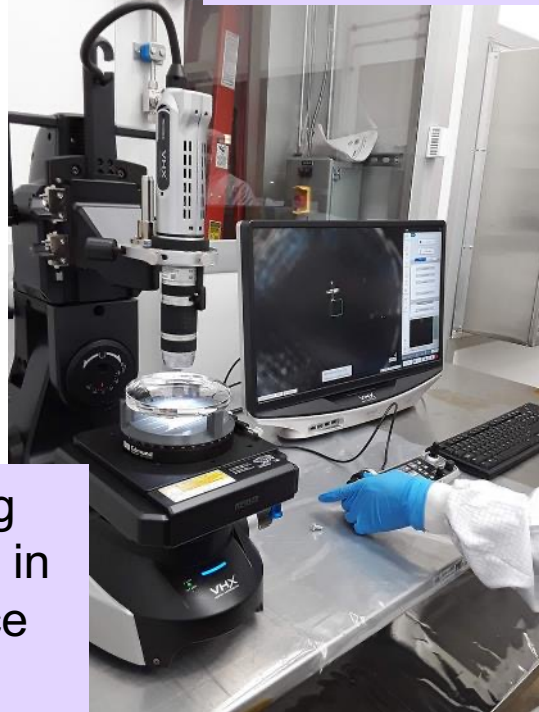
Roman Hardware Progress



All 18 flight certified plus 6 flight spare H4RG Sensor Chip Assemblies (SCAs) are in hand. The Mosaic Plate Assembly Engineering Test Unit (ETU) is assemble with SCAs integrated and testing is underway.

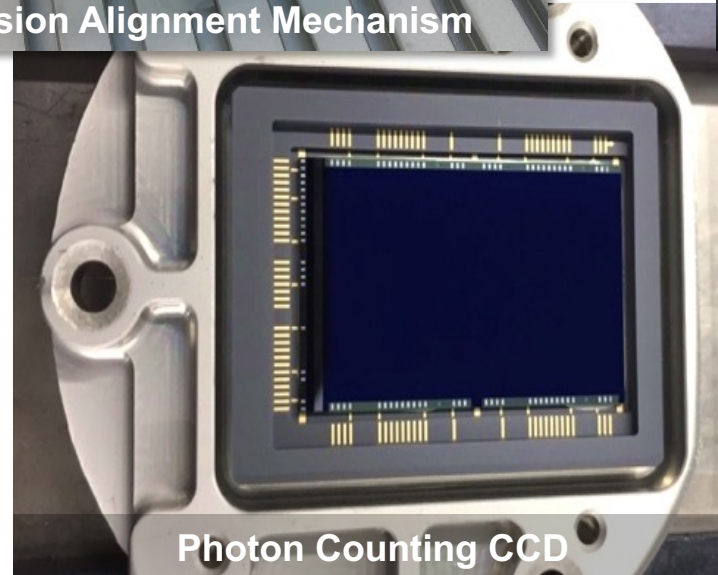
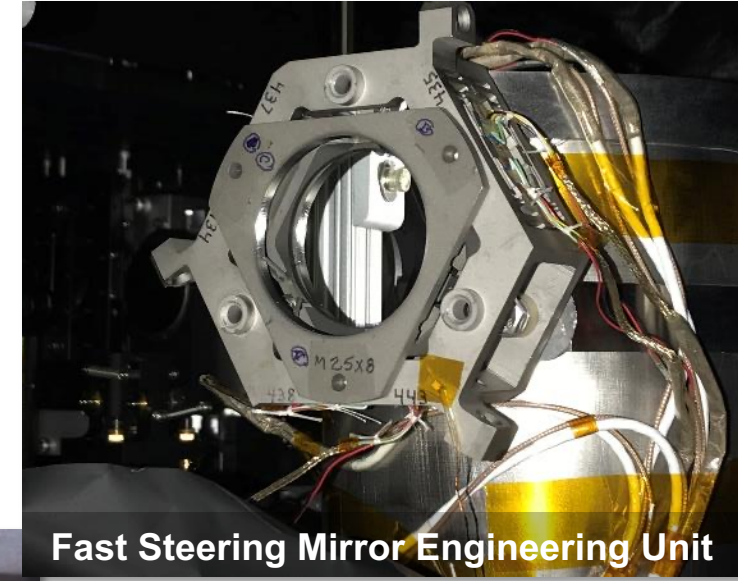
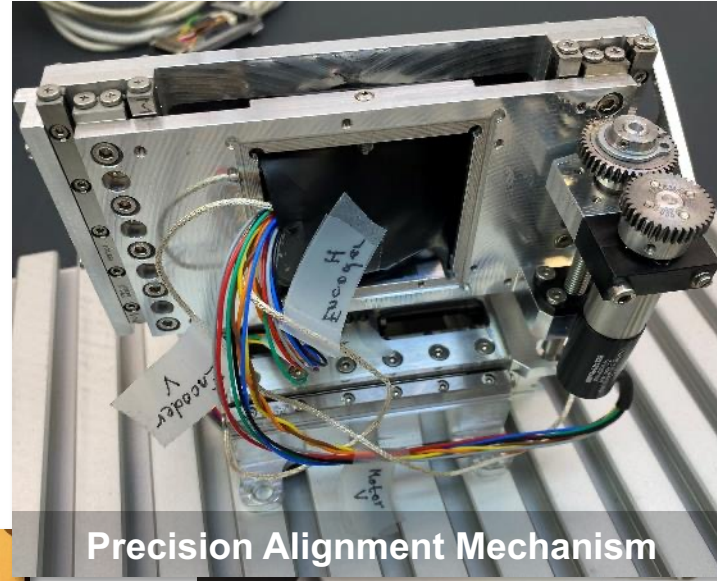


Inspection of the Grating Prism (grism) takes place in the lab at Goddard Space flight Center.



Spacecraft Deployable Engineering Development Units (EDUs) and Mock-ups aid in maturing designs and assembly processes.

Coronagraph Instrument Technology Demonstration Hardware Progress



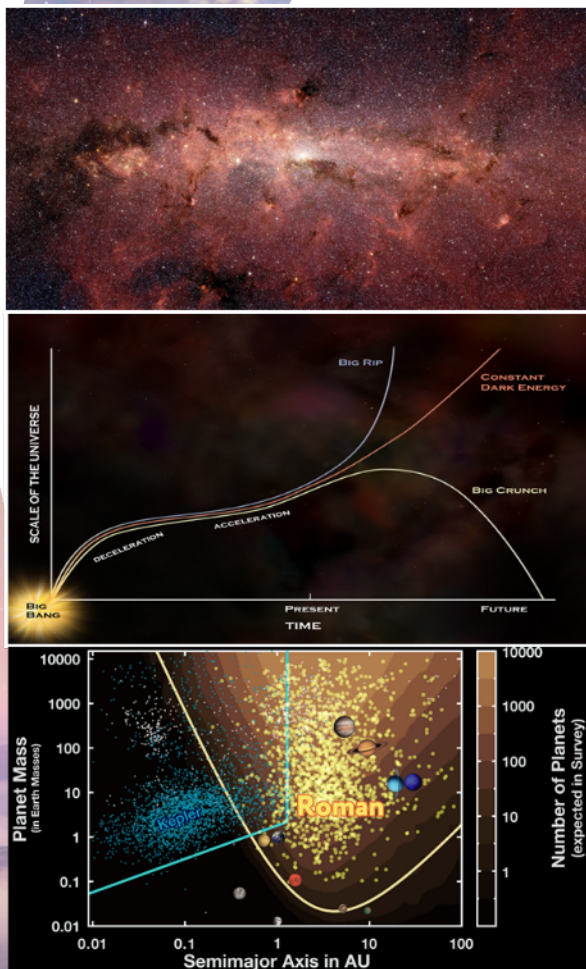
Roman Space Telescope

Opportunities for participation in Roman offered in ROSES-2021

- Key Project Teams: Science teams to conduct scientific investigations using the data from the major surveys identified by the Astro2010 Decadal Survey
- Coronagraph Community Participation Program: Investigators to work with the coronagraph instrument team to plan and execute tech demo observations
- Wide Field Instrument Preparatory Science: Investigators to work on science preparation activities related to mission performance verification and science operations preparation

All Roman observing time is available through open processes

- Major Legacy Surveys will be defined using a community-driven open process
- Key Projects – funded science investigations using these surveys –openly competed
- Roman observing time will be available for General Observer (GO) projects
- All data will be available to the community with no period of limited access

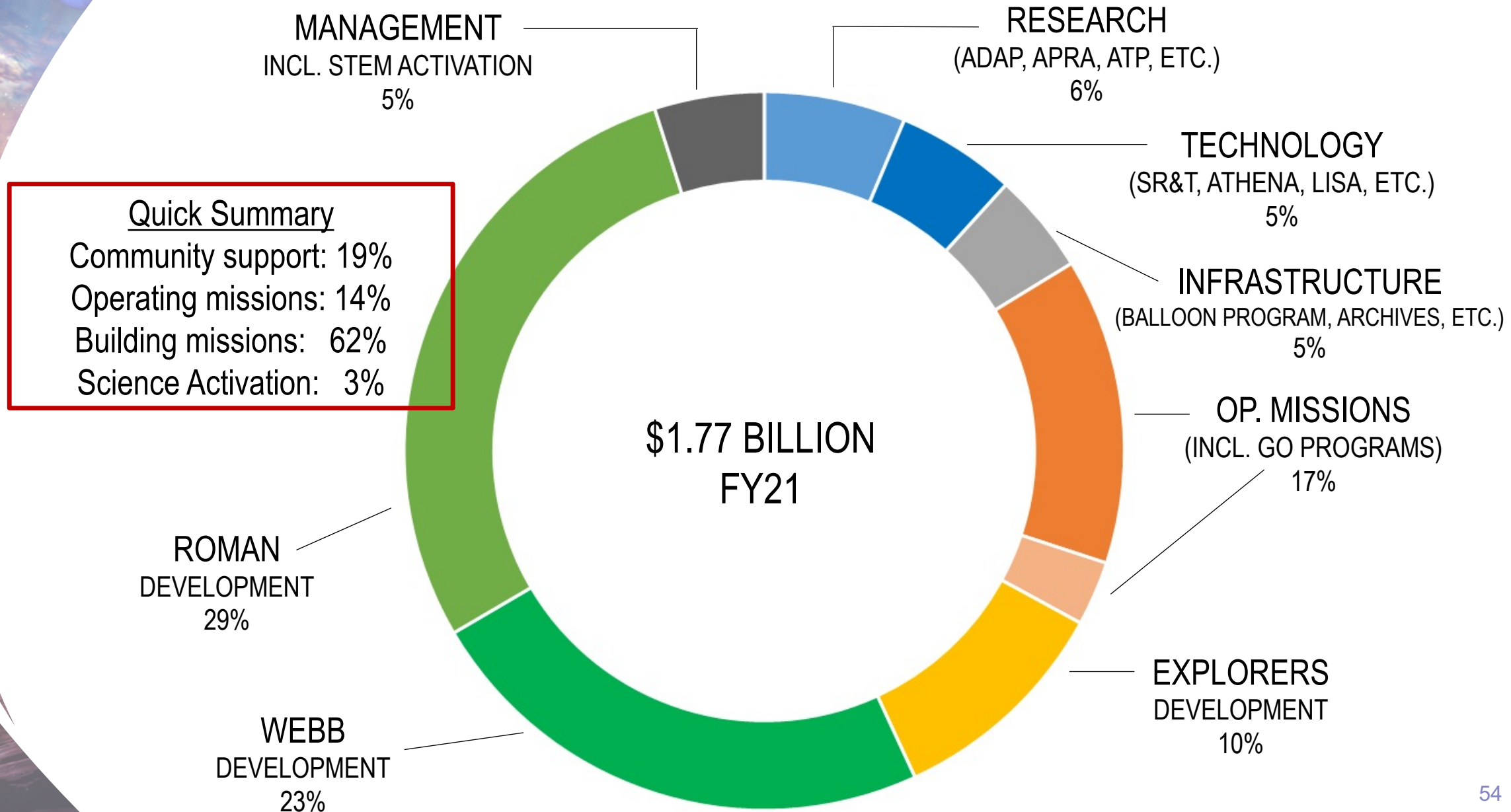




Planning for the Future



Astrophysics Budget – FY21 Op Plan





Agency FY22 Budget Highlights

- A strong NASA budget investing \$24.7 billion dollars for America's future in space; funding proposed represents an increase of 6% over the previous year
- Building the Earth Systems Observatory to enhance and integrate Earth system science and applications to increase the nation's preparation, mitigation and resilience in the face of climate change
- Keeps NASA on the path to land the first woman and the first person of color on the Moon
- Supports NASA efforts to strengthen Inclusion, Diversity, Equity and Accessibility both within NASA and among the space community



SMD FY22 Budget Strategy

*Advance Earth System Science and Applications
to Address the Climate Crisis*

Promote Diversity and Equity in Science

Lead Artemis Science

*Lead a Balanced, Innovative and Open Science
Program driven by the Highest National Priorities*



FY22 BUDGET HIGHLIGHTS

Advance Earth System Science and Applications to Address the Climate Crisis

- Build the Earth Systems Observatory to enhance and integrate research, data and applications to support near-term and long-range decisions by local, state, tribal and federal government officials.
- Address the top technological and science challenges with innovative tools, explorer missions, technology programs, and increased commercial partnerships
- Observations of Earth's land, ocean, ice, and atmosphere to understand the drivers and results of the changing climate
- Research and models advance our understanding of, and ability to predict, the changing climate and its interactions with human communities



FY22 BUDGET HIGHLIGHTS

Promote Diversity, Equity and Inclusion in Science

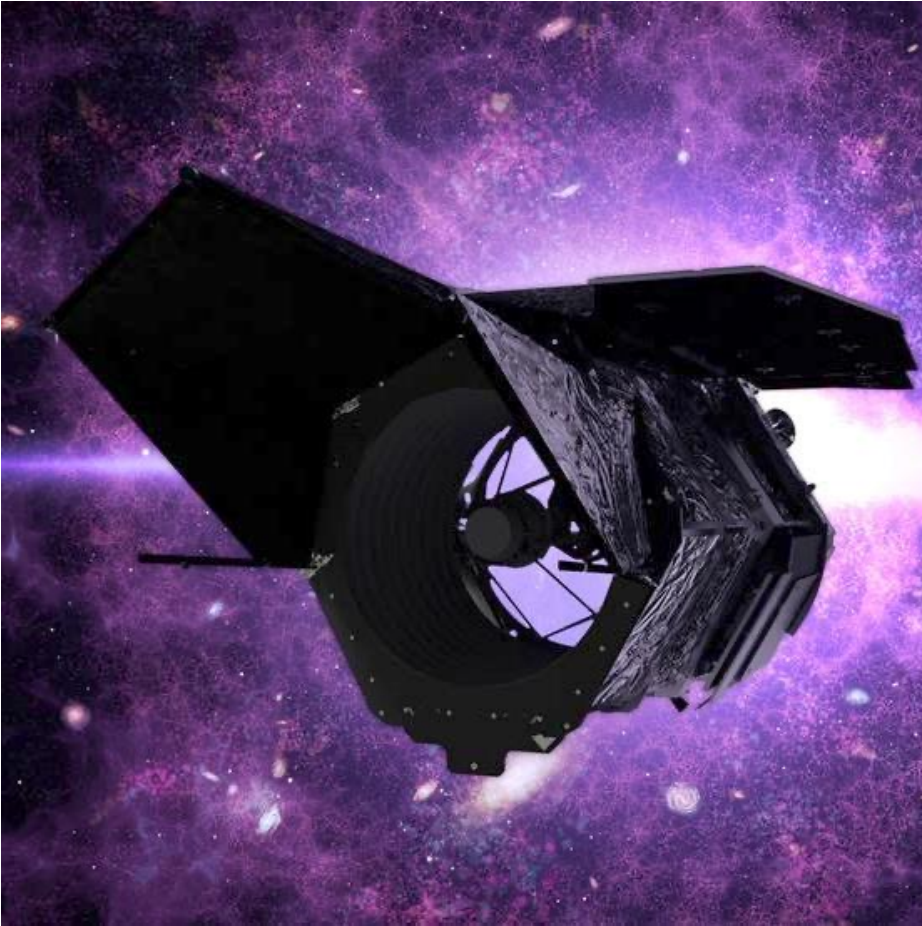
- Diversity of thought, backgrounds and perspectives continue to be welcomed and celebrated as critical to SMD mission success
- Supports systems in place to proactively expand participation of Minority Serving Institutions and Historically Black Colleges and Universities through bridge partnerships and SMD Science Activation Program
- Implementing policy changes to systemically value inclusion such as modifying requirements for Announcements of Opportunities and implementing Dual Anonymous Peer Reviews
- Continually addressing the impact of COVID on diversity



FY22 BUDGET HIGHLIGHTS

Lead Artemis Science

- Be a critical part of the Artemis program with enhanced lunar science and technology demos, and a strong collaboration between science and human exploration
- Enable development of more than 15 missions (including lunar, Mars, and Heliophysics) that inform and enable Artemis work
- Bolster crucial lunar science with Commercial Lunar Payload Services (CLPS) initiative, leveraging commercial partnerships to deliver science and tech payloads beginning in FY2022 to virtually anywhere on the Moon, including the poles and far side
- Begin the search for polar ice early in FY2024 with Volatiles Investigating Polar Exploration Rover (VIPER)



FY22 BUDGET HIGHLIGHTS

Lead a Balanced, Innovative and Open Science Program driven by the Highest National Priorities

- Over 40 missions in formulation and development in FY 2022, including over 25 small missions and a balance of competed and directed missions
- Execute program informed by Decadal Surveys and other National Priorities
- Fund development of Roman Space Telescope, Europa Clipper and Mars Sample Return; Launch and operate Webb Space Telescope
- Expand competed missions with new Earth System Explorers; Enhance Explorers Program in Astrophysics and Heliophysics; Start development of new Discovery Missions
- Establish Open Source Science Initiative to advance transparency, inclusivity, access, and reproducibility in scientific data and research

Astrophysics Budget Features

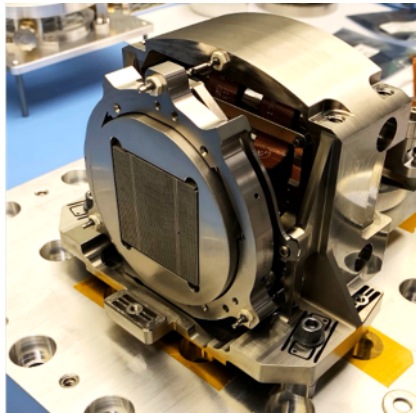
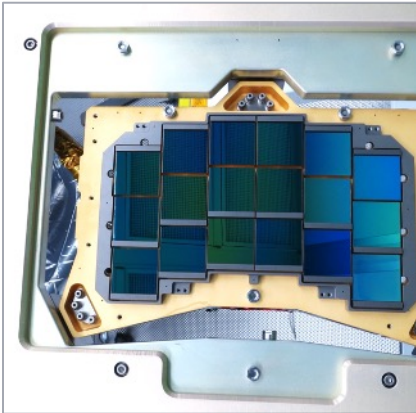
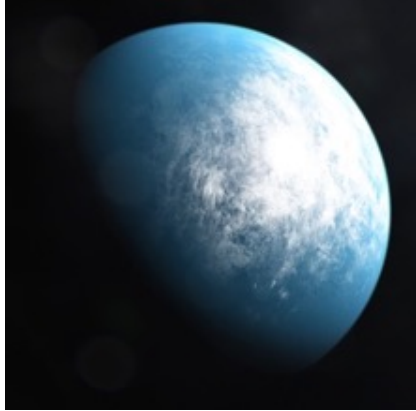
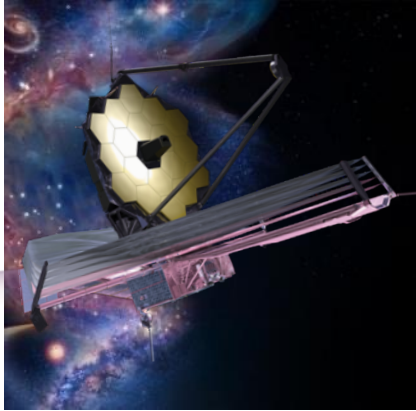
Requests \$1,575.5 M for NASA Astrophysics in FY 2022

What's Changed compared to one year ago (previous budget request)

- Funds continued development of the Nancy Grace Roman Space Telescope and estimated COVID impacts
- Plans for an Astrophysics Probe-class mission and other initiatives pending receipt of the Decadal Survey
- Four Astrophysics Pioneers conducting mission concept studies
- Enhanced facilities and open science initiatives within research program (e.g., laboratory equipment upgrades, extreme precision radial velocity program, formulation for integrating data archives with cloud computing)
- Science activation increases to support diversity and inclusion initiatives
- Astrophysics Strategic Mission Program management funding to support the management of Roman and upcoming probe-class missions in recognition of the enhanced management requirements of these missions

What's the Same compared to one year ago (previous budget request)

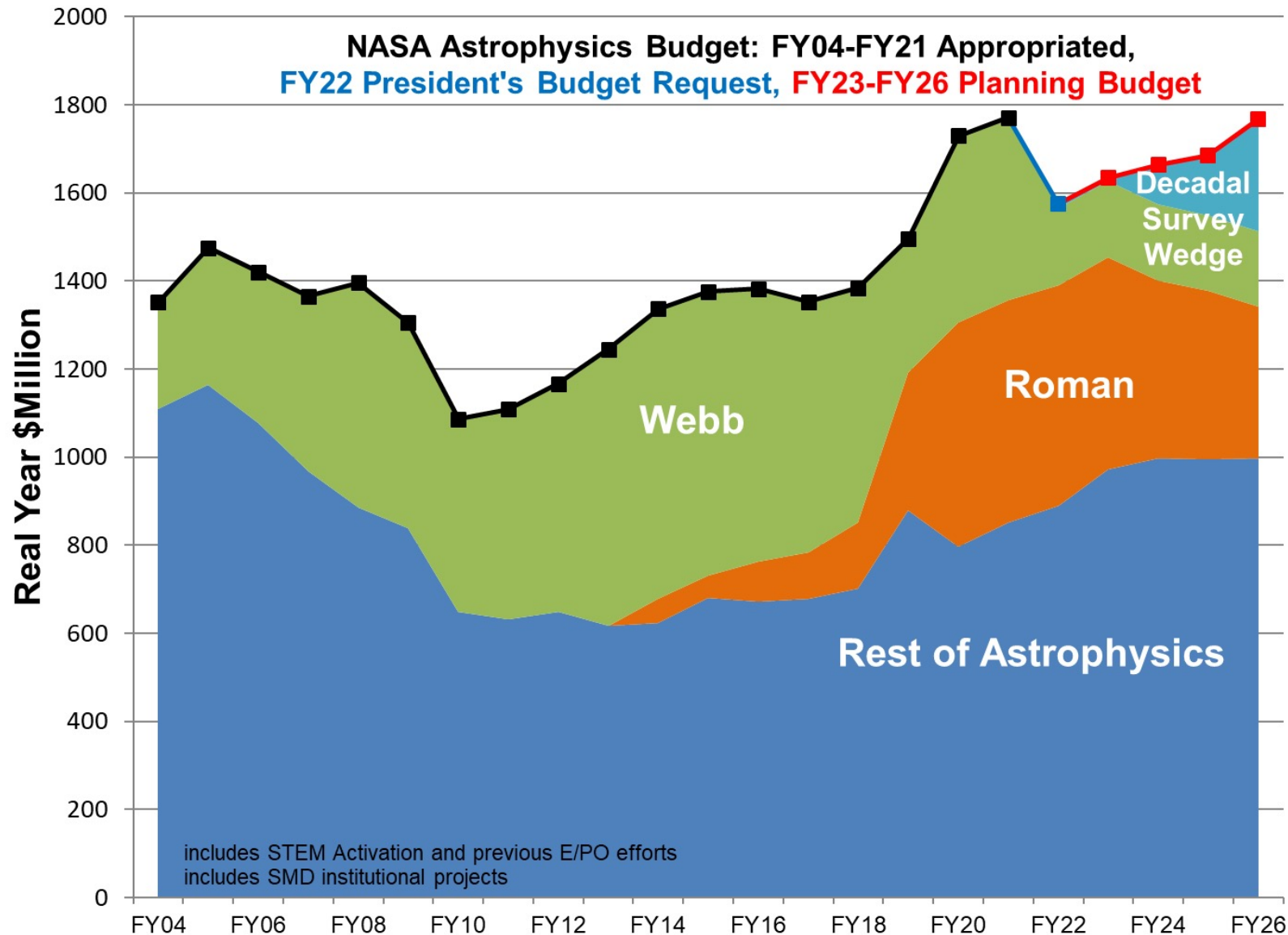
- Webb on track to launch in October 2021 within development cap
- Proposes termination of SOFIA due to its high cost and lower scientific productivity than other missions
- Hubble, Chandra, and other operating missions continue
- Supports development of IXPE, GUSTO, XRISM, Euclid, SPHEREx, and ARIEL
- Maintains Astrophysics Explorers cadence including SMEX downselect and MIDEX AO in 2021
- CubeSat initiative and balloon campaigns within healthy research program



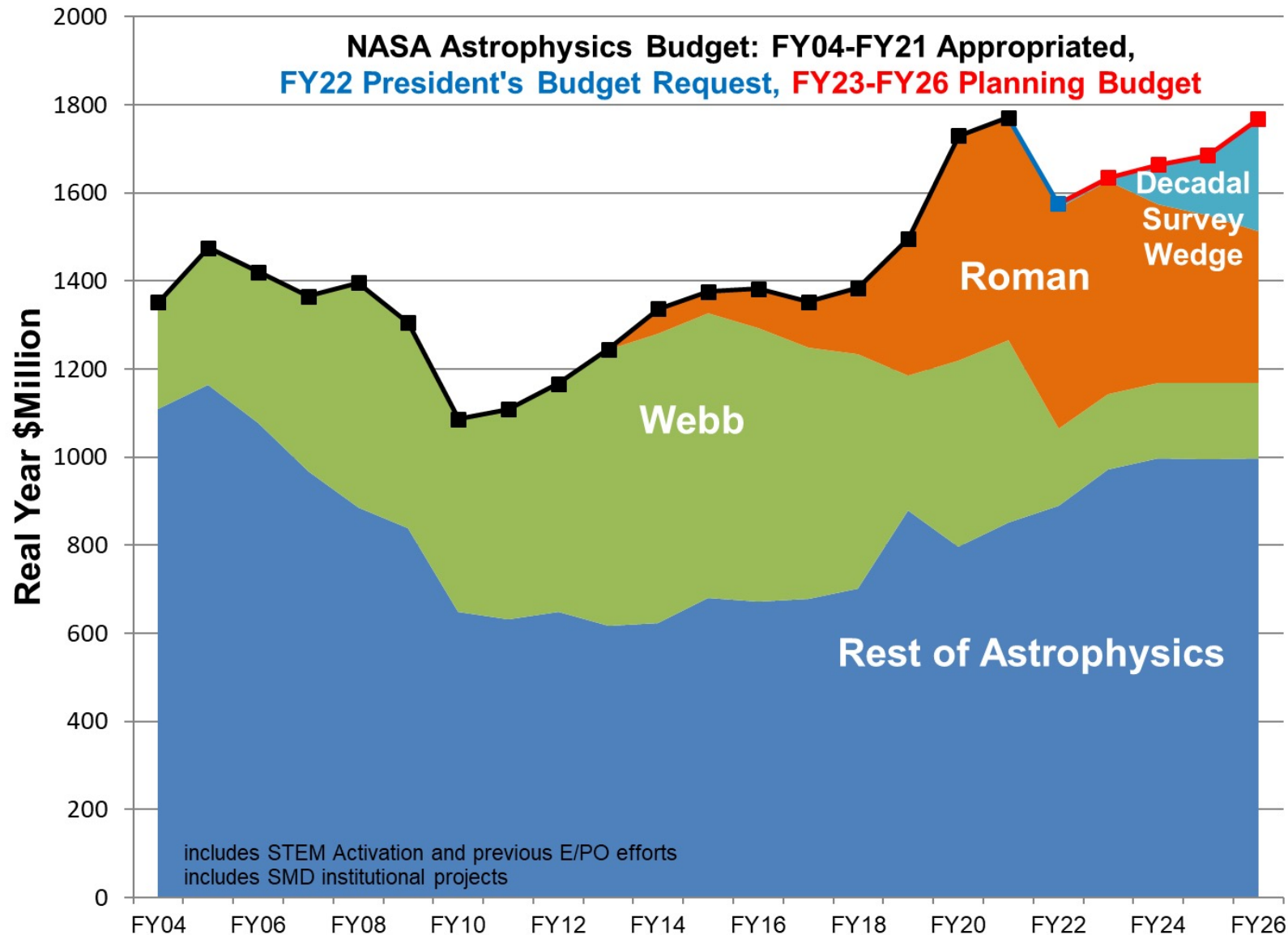
Planned Milestones FY21-22

- Complete integration and launch Webb in 2021
- Complete integration and test for IXPE and launch by early 2022
- Achieve Roman Space Telescope critical design review in 2021
- Achieve SPHEREx critical design review in 2021
- Maintain decadal cadence of four AOs per decade for Astrophysics Explorers and Missions of Opportunity with a SMEX downselect and a MIDEX AO in 2021
- Generate world-class science from operating missions including Hubble Space Telescope and Chandra X-ray Observatory
- Conduct Senior Review of Operating Missions in 2022
- Maintain healthy research program including suborbital-class missions, technology development, data analysis, theoretical and computational investigations, and laboratory astrophysics
- Receive Astrophysics Decadal Survey in 2021
- Plan formulation or solicitation for a Probe mission
- Support mission concept studies and technology investments to implement Astrophysics Decadal Survey priorities starting in 2022

Astrophysics Budget – FY22 Request



Astrophysics Budget – FY22 Request

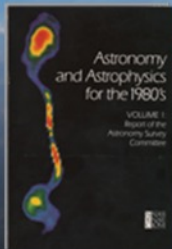


Astrophysics

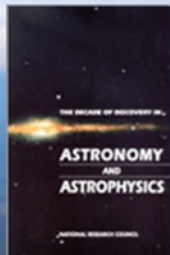
Decadal Survey Missions



1972
Decadal
Survey
Hubble



1982
Decadal
Survey
Chandra



1991
Decadal
Survey
Spitzer



2001
Decadal
Survey
Webb



2010
Decadal
Survey
Roman



2021
Decadal
Survey

?

Astro2010 Scorecard

Recommendation		Response / Status	
L	WFIRST	Roman Space Telescope in Phase C, launch by 2027	✓
L	Explorers: 4 AOs / decade	AOs in 2011, 2014, 2016, 2019, 2021, 2024	✓
L	LISA	Partnered with ESA on LISA, launch in mid-2030s	✓
L	IXO	Partnered with ESA on Athena, launch in early 2030s	✓
M	New worlds technology	Matured coronagraphs & starshades, CGI tech demo on Roman, precursor science (LBTI, NEID, EPRV, etc.)	✓
M	Inflation probe technology	Matured detectors in labs and on balloons	✓
S	R&A augmentations	R&A up 60% from FY10 to FY24; added RTF, TCAN, evolved XRP	✓
S	Mid-TRL technology	Initiated SAT, competed and directed technologies	✓
S	Suborbital-class missions	Added New Zealand, developed super-pressure balloon, added CubeSats, added Pioneers	✓
S	SPICA	Elected not to participate	✗

Preparing for the Decadal Survey: Technology Development and Risk Reduction Activities

Completed

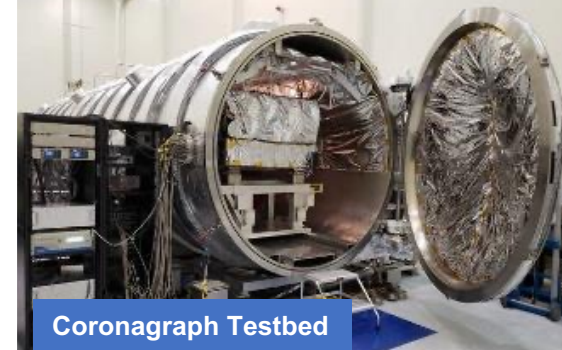
Large Mission Concept Studies / Probe Mission Concept Studies / In-Space Assembly of Telescopes (iSAT) Study / Large Mission Management Study / STMD Technology Collaborations

Ongoing

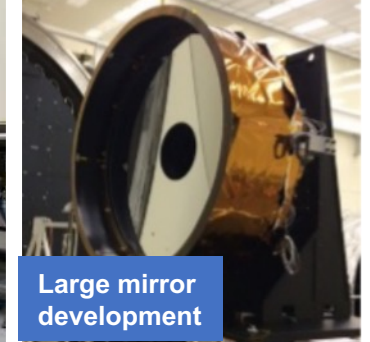
Segmented Mirror Technology Program / Binary Star Coronagraph Technology / Deformable Mirrors / Starshade Technology / Extreme Precision Radial Velocity Research and Technology / Detectors (at all wavelengths) / X-ray Mirrors / Cryocoolers

Testbeds (Coronagraph, Ultrastable, X-ray & Cryogenic)

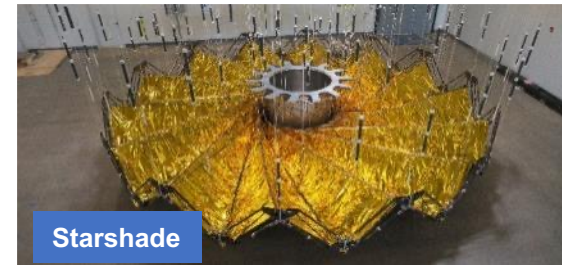
PI-led Strategic Astrophysics Technology (SAT) Advancements



Coronagraph Testbed



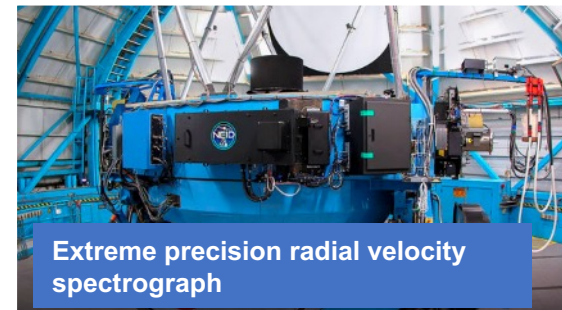
Large mirror development



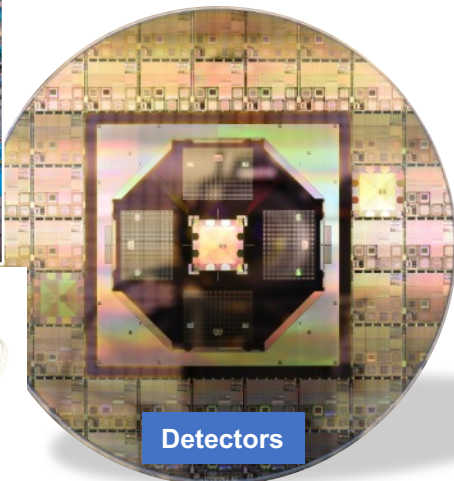
Starshade



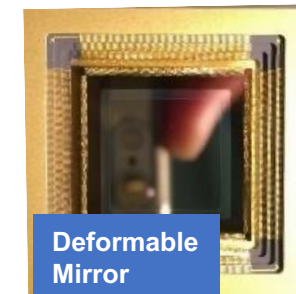
X-ray mirror development



Extreme precision radial velocity spectrograph



Detectors



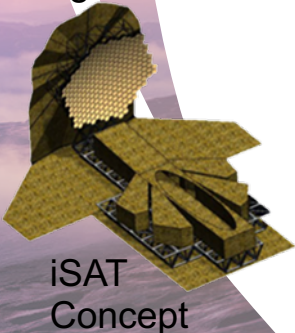
Deformable Mirror



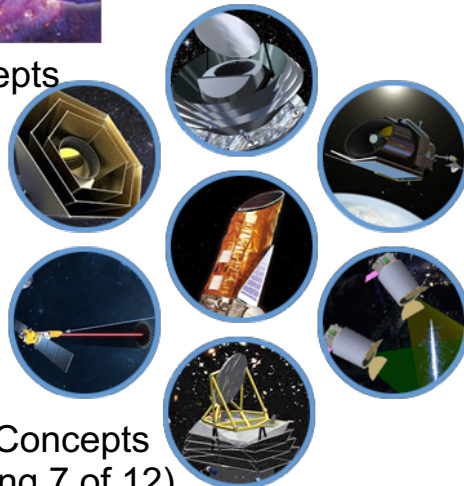
Cryocooler



Large Mission Concepts



iSAT Concept



Probe Concepts
(Showing 7 of 12)

For more information on technology development activities, see the Astrophysics Technology Development Database (<http://www.astrostrategictech.us/>)

NASA Planning for Astro2020



- NASA is planning for implementing the Decadal Survey
 - Reducing risks of large missions via technology development and through studying lessons learned from prior large missions
 - Developing options for recommendations in R&A, archives, suborbital, Explorers, Probes
 - Developing options for flagship risk reduction activities; stay focused on Webb and Roman
 - Holding a wedge in out year planning budget for new initiatives
- NASA plans to provide an initial response to the community within a few months of receiving the Astro2020 Decadal Survey Report
 - Announce implementation of recommendations that can be implemented immediately (within budget, within authority)
 - Announce plans for developing responses to long-term recommendations
 - Communicate and engage with the community throughout

Astrophysics is Looking Up

Webb is launching, Roman is on track

Explorers are being competed and selected regularly

Smaller missions (e.g., CubeSats, Pioneers) are being competed and selected annually

International partnerships are strong

R&A budgets are up, suborbital capabilities are expanding

Technology investments are being made for future missions

NASA is prioritizing an inclusive and diverse astrophysics community, and is initiating changes to address systemic failures that limit accessibility

The FY22 budget request supports all this PLUS contains a funding wedge for a Probe mission and other Decadal Survey priorities

